A DISSERTATION ON

" A STUDY ON CLINICOPATHOLOGY, PROGNOSTIC FACTORS AND ITS RELATION WITH OUTCOME IN PATIENTS UNDERGOING EMERGENCY LAPAROTOMY FOR ILEOCAECAL EMERGENCIES"

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M.S.(General Surgery)

BRANCH I

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CERTIFICATE

This is certify that the dissertation entitled "**A STUDY ON CLINICOPATHOLOGY, PROGNOSTIC FACTORS AND ITS RELATION WITH OUTCOME IN PATIENTS UNDERGOING EMERGENCY LAPAROTOMY FOR ILEOCAECAL EMERGENCIES**" is a bonafide original work of **Dr. S. MURUGANANDAM.,** in partial fulfilment of the requirement for M.S. branch – I (General surgery) Examination of the Tamil Nadu Dr.M.G.R. Medical University to be held in APRIL, 2016 under my guidance and supervision in 2014 – 2015.

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DECLARATION

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LIST OF ABBREVIATIONS

TB	- -	Tuberculosis
RIF	- -	Right Iliac Fossa
GI	- -	Gastrointestinal
AFB	- -	Acid Fast Bacilli
HIV	- -	Human Immunodeficiency Virus
USG	- -	Ultrasonogram
CECT	- -	Contrast Enhanced Computed Tomography
MRI	- -	Magnetic Resonance Imaging
MMC	- -	Migrating Motor Complex

ABSTRACT

BACKGROUND:

Ileocaecal emergency is a common problem encountered in Emergency room in tropical countries like India. Various conditions like Typhoid, TB and Blunt Injury Abdomen are recognized. Despite the availability of modern diagnostic facilities and advances in treatment regimens, this condition is still associated with a high mortality and unavoidable morbidity. The purpose of operative protocol is to correct the pathology while avoiding any serious complications.

METHOD:

This study is conducted in Rajiv Gandhi Government General Hospital in Institute of General Surgery as Retrospective and Prospective study with 50 individuals as subjects.

RESULTS:

This descriptive and observational study was carried out to determine the etiopathological and prognostic factors in patients undergoing emergency laparotomies for ileocaecal emergencies and the associated morbidity and mortality. Age of 50 patients ranged from 18-78 years. The male to female ratio was ~ 2 : 1. On analyzing the co morbid factors, Diabetes Mellitus was the predominant co morbid factor, present in 10% of patients with systemic

hypertension seen in three patients (6%) followed by other factors like CKD, CAD etc . The Most common presentation was small bowel perforations (34%) followed by Obstructed hernia in 20 % of cases. Tachycardia and hypotension are predominant signs. Patients presenting to ER after > 72 hours of onset of symptoms had a mortality rate reaching upto 50%.The Most commonly performed surgery was Resection and Anastomosis (38%). Wound dehiscence and wound infection carries the most common morbidity. In deceased patients, MODS form the most common cause of mortality accounting around 62%.

Conclusion:

Acute bowel pathologies like perforations leading to peritonitis followed by malignancy and blunt injury abdomen are the leading causes of ileocaceal emergencies. The single most important predictor of the mortality seems to be the initial lag period between the onset of symptoms and when the patients are taken up for surgery. . In management Post operative patient education and counseling is of utmost importance. Adequate hydration, electrolyte correction, nutrition management and psychological support teams play a crucial role in bringing significant number of patients for reversal.

CHAPTER 1

INTRODUCTION

INTRODUCTION

Ileocaecal emergency is a common problem seen in tropical countries with the commonest cause being typhoid fever. Over the years a definite changing trend has been observed in ileocaecal pathology in terms of causes, mode of presentation, treatment and prognosis. Despite the availability of modern diagnostic facilities and advances in treatment regimens, this condition is still associated with a high mortality and unavoidable morbidity. The purpose of operative protocol is to correct the pathology while avoiding any serious accidents and to adopt a surgical procedure which is associated with minimal complications. This study has been undertaken in order to contribute to the improvement in the knowledge of this disease. This study aims to study clinical features, management, complications and prognostic factors affecting the outcome in ileocaecal emergencies.

CHAPTER 2

REVIEW OF LITERATURE

REVIEW OF LITERATURE

2.1 ANATOMY:

In the Gastro intestinal system, the Small Intestine forms the major site of digestion and absorption of nutrients also with large surface area forms the major reservoir of immunologically active and hormone producing cells. Even modern diagnostic techniques have come into role like capsule endoscopy there is lack of definitive clinical guidelines for managing individual patients in emergency small bowel conditions.

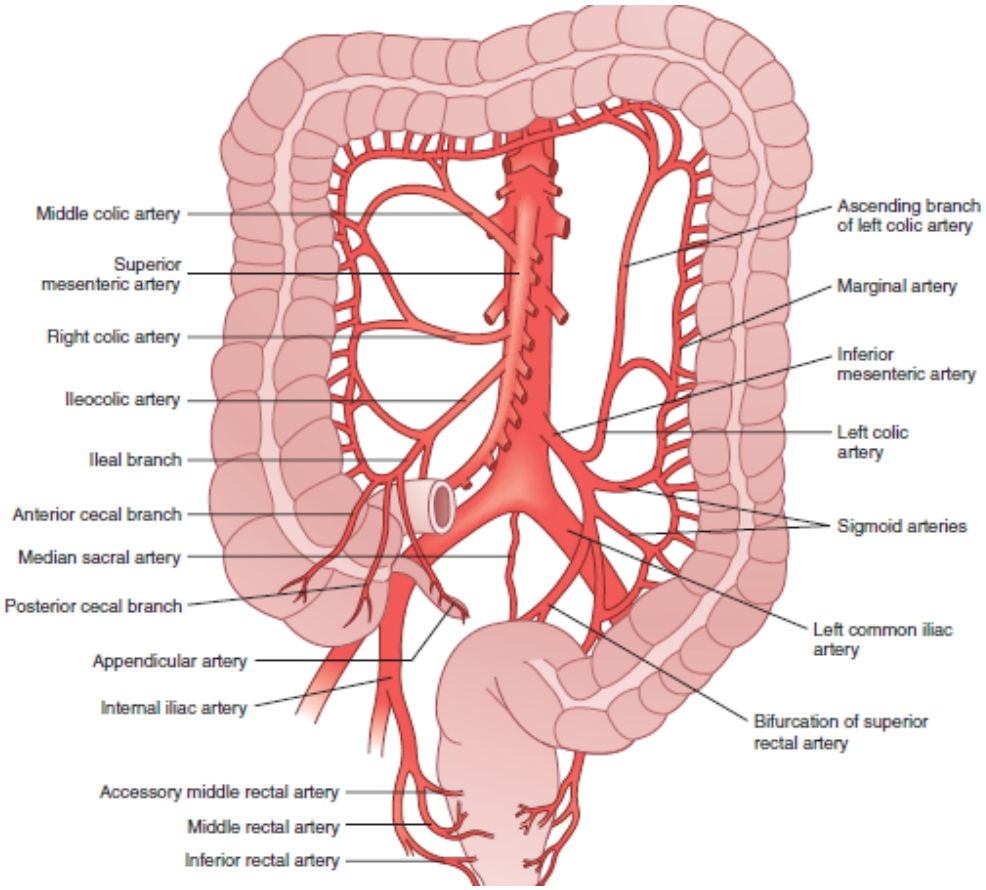


FIG. 1 ANATOMY

The length of small bowel is estimated as 4 – 6 m comprising of duodenum, jejunum and ileum. In Jejunoileal segment proximal 40 % accounts for jejunum measuring 100 to 110 cm and distal 60% accounts for ileum measuring around 150 to 160 cm. Ileum is differentiated from Jejunum by lack of valvulae conniventes, less circumference, short vasa recta and abundance of peyer's patches. Ileum receives its blood supply from Superior Mesenteric artery and venous drainage into inferior mesenteric vein. Lymphatic drainage into left subclavian vein via cistern chyli and thoracic duct. Sympathetic nerve supply is derived from splanchnic nerves and parasympathetic nerve supply via Vagus.

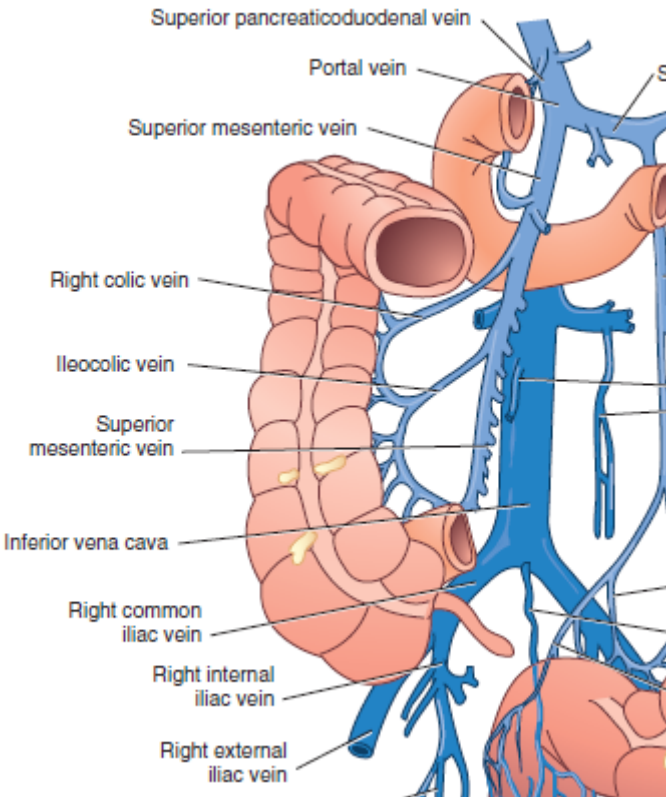
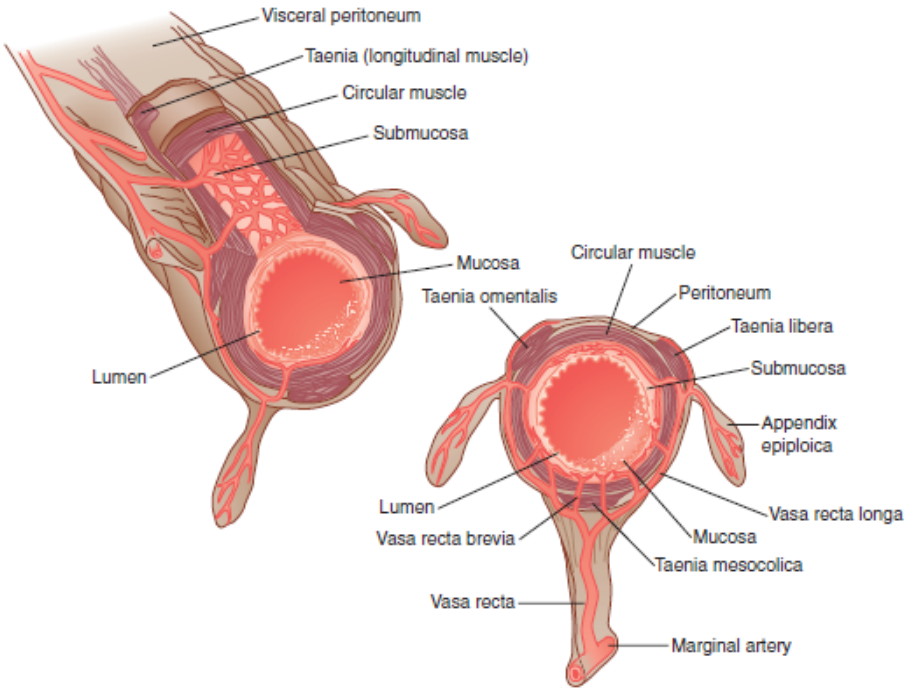


FIG. 2 VASCULAR SUPPLY

The ileum ends at the posterior medial aspect of caecocolic junction where the junction is guarded by thickened, nipple shaped ileo caecal valve. The Ileo caecal valve has upper horizontal lip and lower concave lip and is contracted by sympathetic nerve supply. Caecum, the widest part of colon though with thinnest wall, is sac like with average diameter of 7.5 cm and around 10 cm length. It is distentable, yet dilatation of above 12 cm results in ischemia of bowel wall. It is related anteriorly to intestinal coils and anterior abdominal wall and posteriorly to right psoas and iliacus. Caecum with terminal ileum receives its blood supply from ileocolic artery a branch of superior mesenteric artery, making it more susceptible to ischemic injury during superior mesenteric artery pathologies. The venous drainage and lymphatic drainage parallels the arterial supply. Sympathetic nerve supply to caecum is from T11 to L1 and parasympathetic supply via vagus. 20 % of individuals have mobile caecum. The shape of caecum varies as conical, Intermediate and Ampullary.

The appendix of variable length of about 8 – 10 cm, extends 3 cm below ileo cecal vave from caecum. The wall comprises of five layers namely mucosa, submucosa, circular, longitudinal and serosal layers from inner outwards. The outer longitudinal muscle is separated by ribbon like bands, taeniae coli, three in number named in Right and Left colon as anterior Taenia libera, posterior taenia mesocolica and posterolateral taenia omentalis. In caecum all three converge at appendicular base.



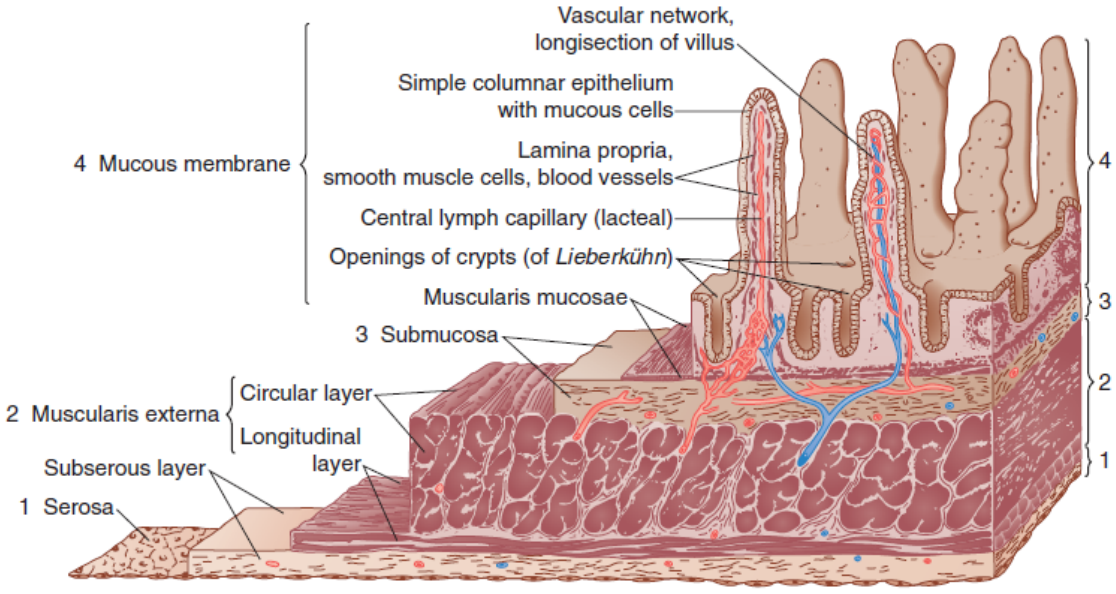


FIG. 3. HISTOLOGY

2.2 PHYSIOLOGY OF SMALL INTESTINE

The physiological functions of small intestine include:

- Digestion and absorption
- Motility
- Endocrine function
- Barrier and immune function

Digestion and Absorption

The complex process of digestion and absorption of nutrients, water, electrolytes, and minerals is the main role of the small intestine. Except for cellulose which is indigestible, almost all food is absorbed. The stomach initiates the process of digestion with the breakdown of solids to particles 1 mm or smaller, which are then delivered to the duodenum, where pancreatic enzymes, bile, and brush border enzymes continue the process of digestion and eventual absorption through the small intestinal wall.

Carbohydrates

Dietary starch is a polysaccharide consisting of long chains of glucose molecules. Amylose makes up about 20% of starch in the diet and is broken down at the α-1,4 bonds by salivary (i.e., ptyalin) and pancreatic amylases that convert

amylose to maltotriose and maltose. Pancreatic amylase is the major enzyme of starch digestion, although salivary amylase initiates the process.

The terminal products of amylase-mediated starch digestion are oligosaccharides, maltotriose, maltose, and α-limit dextrins. These products, as well as the major disaccharides in the diet (sucrose and lactose), are unable to undergo absorption in this form. They must first undergo hydrolytic cleavage into their constituent monosaccharides; these hydrolytic reactions are catalyzed by specific brush border membrane hydrolases that are expressed most abundantly in the villi of the duodenum and jejunum. The three major monosaccharides that represent the terminal products of carbohydrate digestion are glucose, galactose, and fructose.

Transport of these hexoses takes place by active transport. Glucose galactose are absorbed through SGLT-1 Transporter which is a carrier mediated active transport mechanism, involving the cotransport of Na+. Na+ pulls the glucose or galactose along with it, as it diffuses into the inside of cell thereby providing the energy needed for transport of the monosaccharide. The exit of glucose from the cytosol into the intracellular space is by GLUT-2 transporter, a Na+-independent carrier located at the basolateral membrane. Fructose is absorbed from the intestinal lumen through facilitated diffusion.

GLUT-5, which is a Na+/energy independent carrier located in the apical membrane of the enterocyte is involved in fructose absorption. Fructose exits the basolateral membrane through GLUT-2 transporter.

Proteins

Digestion of protein in small intestine is carried out by pancreatic proteases.

Pancreatic trypsinogen(inactive form)

↓

Enterokinase

↓

Trypsin

Trypsin, chymotrypsin and elastase the endopeptidases act on peptide bonds producing peptides which are the substrates for the exopeptidases-carboxypeptidases. A single amino acid is removed from the carboxyl end splitting the complex proteins into di- and tri-peptides. They are absorbed from the lumen by Na+ mediated active transport mechanism. They are further digested by aminopeptidases and dipeptidases into tri and di – peptides and aminoacids which get transported into the epithelial cells through microvilli. Additional peptidases hydrolyze the dipeptides and tripeptides into single amino acids in the cytosol. These then pass through the epithelial cells into the portal venous system.

Fats

Triglycerides composed of a glycerol nucleus and three fatty acids, are the most abundant fats. Phospholipids, cholesterol, and cholesterol esters also found in small quantities in the normal diet. All of fat digestion occurs in the small intestine. Emulsification is the process, by which fat globules are broken down into molecules so that the water soluble digestive enzymes can act on them.

It is facilitated by bile from the liver. The bile contains bile salts and the phospholipid lecithin. The fat-soluble portions of the bile salts and the lecithin dissolve in the surface layer of the fat globules and the polar portions, that project outward, are soluble in the surrounding aqueous fluids. This arrangement makes them more accessible for fragmentation by agitation.

Micelle Formation

By the formation of micelles, absorption of fats are accelerated. Micelles are small spherical globules composed of 20 to 40 molecules of bile salts with a sterol nucleus that is highly fat soluble, and a hydrophilic polar group that projects outward. The mixed micelles thus formed are arrayed so that the insoluble lipid is surrounded by the bile salts oriented with their hydrophilic ends facing outward. When the monoglycerides and free fatty acids are formed by lipolysis, they become dissolved in the central hydrophobic portion of the micelles, which then act to carry these products of fat hydrolysis to the brush borders of the epithelial cells, where absorption occurs.

Intracellular Processing

After disaggregation of the micelle the released fatty acids and monoglycerides in the cell re-form into new triglycerides by the enzymes in the endoplasmic reticulum. The major pathway for resynthesis involves synthesis of triglycerides from 2-monoglycerides and coenzyme A (CoA) – activated fatty acids. Microsomal acyl-CoA lipase helps in the synthesis of acyl-CoA from the fatty acid before esterification. Chylomicrons are formed consisting of an inner core containing triglycerides and a membranous outer core of phospholipids and apoproteins.

Chylomicrons from epithelial cells → into lacteals → lymphatics

↓

Venous system

The shorter chain fatty acids are more water-soluble so they absorbed directly into portal blood.

Enterohepatic Circulation

The unconjugated bile acids by the process of passive diffusion are absorbed into the jejunum. The conjugated bile acids that form micelles are absorbed in the ileum by active transport and are reabsorbed from the distal ileum. They pass through the portal venous system to the liver and secreted as bile. The total bile salt

pool in humans is 2 to 3 g. The enterohepatic circulation of bile salts is 6 times/ day.

Only about 0.5 g is lost in the stool every day which is replaced by resynthesis from cholesterol, Water, Electrolytes, and Vitamins. Of the 8 to 10 liters of water/day entering the small intestine, much is absorbed, with only 500 mL entering the colon.

Water is absorbed by either simple diffusion or by osmotic pressure. Electrolytes are absorbed in the small bowel by either active transport or by coupling to organic solute. Na+ through basolateral membrane by active transport. Cl- by passive diffusion in the upper part of the intestine

HCO3 absorption: When Na+ is absorbed , H+is secreted into the lumen.

$H^+ + HCO_3 \longrightarrow$ Carbonic acid $\longrightarrow H_2O + CO_2$

Water remains in chyme, CO_2 expired.

Calcium absorption occurs in duodenum and jejunum through active transport in an acid environment. Vitamin D and parathyroid hormone enhances its absorption.

Iron as heme or non heme component by an active process in duodenum. Potassium, magnesium, phosphate, are also absorbed by active process.

Vitamins:

The absorption of water-soluble vitamins is complex.

Vitamin	Mechanism of absorption	Site of absorption
Vitamin C	Active transport	
Vitamin B6	Simple diffusion	Proximal intestine
Vitamin B1(thiamine)	Active transport	Jejunum
Riboflavin (vitB12)	Facilitated transport	Upper intestine

Vitamin B_{12} absorption occurs in the terminal ileum.

Cobalamin +intrinsic factor(secreted by stomach)

↓

By translocation enters into ileal enterocyte

↓

Free vitB_{12} binds to transcobalamin II

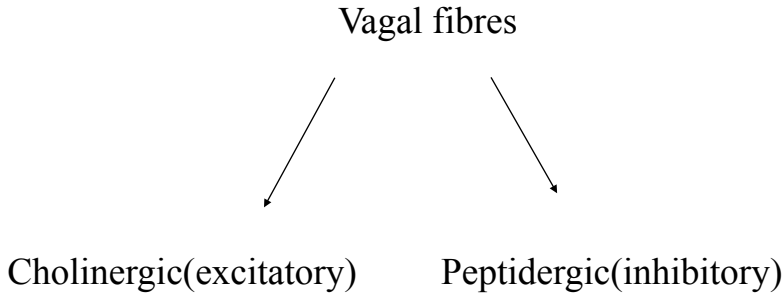
↓

Into portal circulation

MOTILITY

Complex series of muscular contractions propel the food particles through the small bowel. These contractions pass aborally at a rate of 1 to 2 cm/second. The major function of peristalsis is the movement of intestinal chyme through the intestine. Motility patterns that occur in the small bowel are different in the fed and fasted states. In the fed state, the pacesetter potentials originating in the duodenum propel food through the small bowel.

During the fasting period between meals, the migrating myoelectric complex (MMC), which is under the control of neural and humoral pathways initiates the regular and cyclical contractions every 75 to 90 minutes. The vagal and sympathetic are the extrinsic nerves to the small bowel.



Motilin which is a peptide, is found at its peak plasma level during phase III (intense bursts of myoelectrical activities resulting in regular, high-amplitude contractions) of MMCs.

ENDOCRINE FUNCTION

Gastrointestinal Hormones

Small bowel is the largest endocrine organ in the body. The hormones produced act in an endocrine, paracrine or autocrine fashion. They also act as neuro transmitters.

Vaso active intestinal peptide

They play a major role in pancreatico biliary and intestinal secretion and motility, exert a trophic effect on normal and neoplastic intestinal mucosa and pancreas.

Receptors

The gastrointestinal hormones primarily signal through G protein–coupled receptors. Agonist binding to the seven transmembrane domain receptor causes a conformational change in the receptor that allows it to interact with G proteins.

Cyclic adenosine monophosphate (cAMP), Ca2+ , Cyclic guanosine monophosphate (cGMP), and inositol Phosphate are the intracellular second messengers that are then activated. Epidermal growth factor (EGF), TGF-α and -β, insulin-like growth factor (IGF), fibroblast growth factor (FGF), and platelet-derived growth factor act through tyrosine kinase receptor and are involved in cell growth and differentiation.

The ion channel–linked receptors, are found in cells of neuronal lineage and bind neurotransmitters like acetylcholine and serotonin which are the excitatory and γ-aminobutyric acid, glycine which are the inhibitory.

IMMUNE FUNCTION

Because of constant antigenic exposure, the intestine has abundant lymphoid cells and myeloid cells. The gut associated lymphoid tissue is localized in three areas—Peyer patches, lamina propria lymphoid cells, and intraepithelial lymphocytes. Peyer patches are unencapsulated lymphoid nodules that form an afferent limb of the gut-associated lymphoid tissue. The follicle associated epithelium contains the microfold M cells. Peyers patches recognizes antigens through these cells by sampling mechanism.

Antigens activate and prime B and T cells in that site. The M cells cover the lymphoid follicles thereby provide a site for the selective sampling of intraluminal antigens. Activated lymphocytes leave the intestinal tract and migrate into afferent lymphatics draining into mesenteric lymph nodes. These cells migrate into the lamina propria. The B lymphocytes become surface immunoglobulin A (IgA)–bearing lymphoblasts involved in mucosal immunity. B lymphocytes and plasma cells, T lymphocytes, macrophages, dendritic cells, eosinophils, and mast cells are present throughout the connective tissue of the lamina propria.

Of the lymphoid cells, 60% are T cells. Approximately 40% of the lymphoid cells are B cells, which are derived from precursors in Peyer patches. The B cells and plasma cells produce IgA mainly and IgM, IgG, IgE.

The intraepithelial lymphocytes are mostly T cells. On activation, they acquire cytolytic functions and cause apoptosis. They are involved in the immunosurveillance against abnormal epithelial cells. The major role of the intestine is in the synthesis of IgA (70% in the body produced).The IgA antibody enters into the lumen by a carrier. IgA inhibits the bacterial adherence to epithelial cells and prevents their colonization and multiplication. And it neutralizes bacterial toxins and viral activity and blocks the absorption of antigens from the gut.

2.3 PHYSIOLOGY OF LARGE INTESTINE

Fluid and Electrolyte Exchanges

Water, Sodium, Potassium, Chloride, Bicarbonate, and Ammonia.

The colon is a major site for water absorption and electrolyte exchange. Approximately 1000–2000 mL/day of water (90%) is absorbed in the colon by osmotic gradient along with Na+.

Ions	Mechanism of absorption
Sodium	Na+ -K+ ATPase
Potassium	Passive diffusion
Chloride	Chloride – bicarbonate exchange

Ammonia is produced by the degradation of protein and urea by the colonic bacteria which gets absorbed and transported to the liver. Absorption of ammonia depends in part on intraluminal pH. A decrease in colonic bacteria (e.g., due to broad spectrum antibiotic use) and/or a decrease in intraluminal pH (e.g., due to lactulose administration) will decrease ammonia absorption.

2.4 PATHOPHYSIOLOGY :

SMALL BOWEL OBSTRUCTION:

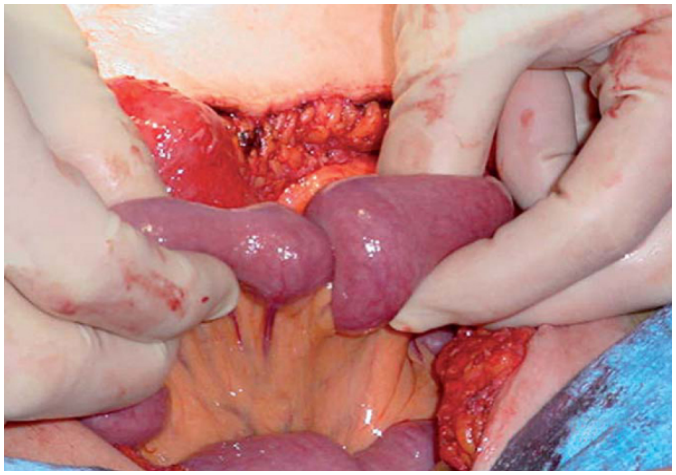


FIG 4. SMALL BOWEL OBSTRUCTION

Small bowel obstruction has been reported in fourth century BC when Praxagoras when he created enterocutaneous fistula to relieve bowel obstruction. With better understanding of the pathophysiology of obstruction and with the use of isotonic fluids, resuscitation, bowel decompression and antibiotics has greatly reduced the mortality rate in patients with a mechanical bowel obstruction.

Mechanical small bowel obstruction is the commonest surgical disorder in small intestine. It may be due to

1. Intraluminal
2. Intramural
3. Extrinsic

Common Etiologies are:

1. Adhesions
2. Neoplasms
3. Hernias- External, Internal
4. Volvulus
5. Crohn's disease
6. Intussussception
7. Radiation induced stricture
8. Foreign body
9. Gall stone ileus
10. Diverticulitis

11.Meckel's diverticulum

12.Hematoma

13.Congenital

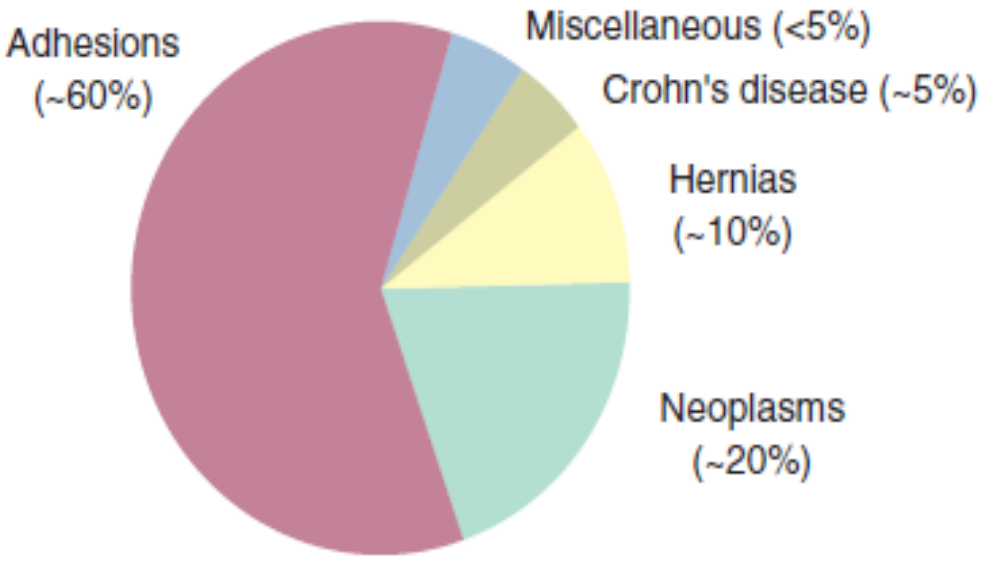


FIG 5. ETIOLOGIES OF SMALL BOWEL OBSTRUCTION

There is increase in an effort to propel luminal contents past the obstructing point early in the course of an obstruction by increased intestinal motility and contractile activity. Hence early in the course of bowel obstruction there is increase in peristalsis above and below the point of obstruction, thus causing diarrhea which occurs in partial or even complete small bowel obstruction in the early period. Later in the course of obstruction, intestine fatigues and dilates, with contractions

becoming less frequent and less intense. As the bowel dilates, water and electrolytes accumulate intraluminally and also in the bowel wall. This massive fluid loss in third space leads to dehydration and hypovolemia.

With a proximal obstruction, dehydration may be accompanied by hypochloremia, hypokalemia and metabolic alkalosis associated with increased vomiting. Distal obstruction of the small bowel leads to accumulation of large quantities of intestinal fluid into the bowel; however, abnormalities in serum electrolyte levels are usually less dramatic.

The small bowel luminal flora which is usually sterile, which further change into multiplication of various pathogens and also translocation of bacteria into lymph nodes occurs. With increase in intraluminal pressure there is impairment of microvascular perfusion leading to ischemia and necrosis, the condition termed as strangulated bowel obstruction.

Partial obstruction due to incomplete obstruction, the pathological changes tends to occur slowly. In closed loop obstruction, there is proximal and distal dilatation leading to accumulation of fluid and gas with rapid progression to strangulation. Adhesions, particularly after pelvic operations like gynecologic procedures, appendectomy, colorectal resection accounts more than 60% of all causes of bowel obstruction in Western countries. Lower abdominal procedures produce adhesions that result in obstruction which is attributed thought to be

caused by the fact that the bowel is more mobile in the pelvis and more tethered in the upper abdomen.

LARGE BOWEL OBSTRUCTION:

It is classified as

1. Mechanical (dynamic)
2. Non dynamic (pseudo obstruction)

The most common cause is colorectal cancer.

In India, Hyperplastic tuberculosis forms one of the commonest cause of obstruction.

1. Intraluminal (fecal impaction, inspissated barium, foreign bodies)
2. Intramural (Carcinomas, Diverticulitis, Crohn's)
3. Extramural (Adhesions).

Colon distends with gas, stool, liquid. There is strangulation if associated with hernias. Initially, the venous return is impaired leading to swelling which compromise arterial supply leading to Ischemia and necrosis.

SPECIFIC CONDITIONS:

TYPHOID ENTERITIS:

In developing countries like India, Typhoid fever poses significant morbidity and mortality in general population where poor hygiene, contaminated water and improper waste disposal persist. Younger individuals are frequently affected though a decreasing trend seen in developed countries. Typhoid enteritis is due to acute infection of Salmonella typhi usually of several weeks duration.

Due to ingestion of the bacilli, it tracks down to intestinal mucosa and penetrates. Following which spread occurs via lymphatics and then systemic spread occurs via bloodstream. Pathological changes include hyperplasia of Peyer's patches in ileum, and hyperplasia of major reticuloendothelial system like liver and spleen. Peyer's patches on inflammation ulcerate leading to hemorrhage or perforation. Certain studies have shown hemorrhage rates of upto 20% of infected patients.

FIG 6. PERFORATION

Laparotomy is required for massive hemorrhage. In 2% of patients, perforation occurs with incidence being high in tropical countries. A single perforation in terminal ileum is the usual manifestation which warrants laparotomy and simple closure of the perforation. Around 25% of patients manifest with multiple perforation requiring resection with primary anastomosis or exteriorization.

TUBERCULOSIS:

Though a rare disease of western countries, mycobacterium forms one of the major cause for intestinal emergencies in developing countries like India.

Usually a disease of Immunocompromised hosts, Mycobacterium tuberculosis enters via swallowing as Mycobacterium avian complex (MAC). After entering, the bacteria penetrate the intestinal mucosa and triggers inflammation. Distal ileum and caecum are frequently involved (85% to 90%) and disease manifests as

1. Ulcerative
2. Ulcero Hypertrophic
3. Hypertrophic

The bowel wall gets thickened resulting in an inflammatory mass in ileo caecal region.

Acute inflammation is followed by strictures and fistula formation. Multiple tubercles are present in the serosal surface. Mesenteric lymph nodes are frequently enlarged and thickened, on examination, caseous necrosis is noted. The mucosa is

hyperemic, edematous and ulcerated. Histologically, the hallmark lesion is a granuloma with caseating granulomas in lymph nodes. The indications for surgery in patients with Tuberculosis is either Obstruction or Fistula formation.

FIG 7. SMALL BOWEL ADHESIONS

In Ulcerative tuberculosis, multiple ulcers lying transversely with thickened, reddened serosa occurs in terminal ileum .

Hyperplastic Tuberculosis manifests in patients with increased resistance to Mycobacterium organisms. Lymphoid follicles are infected and chronic inflammation sets in leading to thickening of intestinal wall and narrowing of bowel lumen. Due to early involvement of regional lymph nodes, caseating necrosis occurs.

WHY TUBERCULOSIS COMMONLY AFFECTS ILEOCECAL REGION?

It is because of

1. Increased physiological stasis
2. Increased rate of absorption
3. Minimal digestive activity
4. Abundance of lymphoid tissue

Volvulus of small intestine:

Volvulus most commonly involves the lower ileum which may be primary or secondary. It is commonly due to adhesions in western and developing countries whereas spontaneous volvulus are reported in African population.

Volvulus of Caecum:

Large intestine volvulus accounts for 4% of large bowel obstruction. Caecal volvulus occurs in the age group of 40s to 50s, more commonly in females usually a clockwise twist. The condition leads to ischemia of bowel and initially manifests as partial bowel obstruction with passage of flatus and stools. Caecal volvulus occurs along with terminal ileum due to freely mobile caecum termed as caecal bascule which is mobile from caudad to cephalad direction .

Mesenteric Ischemia:

Mesenteric Ischemia falls into two categories:

1. Acute
2. Chronic

The Pathological mechanisms are

1. Arterial Embolus
2. Arterial thrombosis
3. Non occlusive mesenteric Ischemia
4. Venous thrombosis

FIG 8. MESENTRIC ISCHEMIA

The most common cause is embolus occurring in more than 50% of patients usually arising from the left atrium or ventricles or valvular lesions. Most of the patients (95%) have predisposing cardiac lesion. In 50% of cases, embolism arises from superior mesenteric artery and lodges distal to origin of middle colic artery at branch points mid to distal superior mesenteric artery.

In thrombosis, occlusion occurs in proximal mesenteric arteries at their origin. Acute thrombosis usually superimposed on preexisting atherosclerotic lesion. NOMI due to vasospasm occurs in critically ill patients receiving vasopressors.

In 5 % to 15% of acute mesenteric ischemia, mesenteric venous thrombosis is identified as causative factor in which 95% involves superior mesenteric vein. It is either primary if no etiology identified or secondary, if inheritable or acquired coagulation defects identified.

Pathophysiologically intestinal ischemia and mucosal sloughing occurs in 3 hours and intestinal infarction sets in 6 hours. In chronic mesenteric ischemia due to collateral circulation, intestinal infarction is a rare entity. Chronic mesenteric ischemia results from atherosclerotic lesions in celiac, superior mesenteric and inferior mesenteric vessels. Portal and splenic veins may be involved leading to splenomegaly, esophagogastric varices and hypersplenism.

2.5 CLINICAL PRESENTATION OF SMALL BOWEL OBSTRUCTION:

Small bowel obstruction usually presents with colicky abdominal pain, nausea, vomiting and obstipation.

Vomiting is commonly seen in proximal obstructions when compared to distal obstructions. The colour of vomitus is very useful as bacteria grows, the vomitus becomes more feculent, giving a clinical clue of established obstruction. Continued passage of flatus & stools beyond 6 to 12 hours since the onset of

symptoms is characteristic of partial obstruction compared to a complete obstruction.

Abdomen distension is an important sign of small bowel obstruction which is more pronounced in the distal ileum. It is absent if the site of obstruction is in the proximal small bowel. Initially bowel sounds are hyperactive. In later stages of bowel obstruction, bowel sounds are either minimally heard or not heard at all. Laboratory investigations reveal intravascular volume depletion which is indicated by hemo concentration and electrolyte abnormalities. Mild leukocytosis is common.

Strangulated obstruction presents with abdominal pain disproportionate to the degree of abdominal findings suggesting of intestinal ischemia. Patient present with tachycardia, fever, localized abdominal tenderness and marked leukocytosis.

Any of these findings should provoke the surgeon with the possibility of strangulation since this needs urgent surgical intervention.

DIAGNOSIS:

Diagnostic evaluation should mainly concentrate on the following points:

(a) to distinguish ileus and mechanical obstruction,

(b) finding out the etiology of obstruction,

(c) to differentiate partial and complete obstruction,

(d) to distinguish simple from strangulating obstruction.

Histories suggesting of previous abdominal operations (gives a clue of adhesions) and abdominal disorders like carcinomas or inflammatory bowel disorders may provide important clues regarding the cause of obstruction. During general examination, a careful search for inguinal and femoral hernias should be made.

Radiographic examination usually confirms the diagnosis of small bowel obstruction. The abdomen series consist of

(a) X ray of abdomen of the patient in supine position,

(b) X ray of abdomen with the patient in upright position,

(c) X ray of chest with the patient in upright position.

Dilated small bowel loops greater than 3 cm in diameter, presence of air fluid levels on erect films and paucity of colonic shadows is a triad suggestive of small bowel obstruction. The sensitivity of X rays in detecting small bowel obstruction is 70% to 80%. It has a very low specificity because similar features an also be seen in paralytic ileus and colonic obstructions. Air fluid levels or bowel distension may not be seen when obstruction is in proximal small intestine and the bowel lumen is filled with fluid but no gas resulting in a false negative impression. This situation is seen in closed loop obstruction. In spite of these demerits abdomen X rays play a crucial role in the diagnosis of patients with small bowel obstruction. Widespread availability and low cost add on to its additional benefits.

In detecting small bowel obstructions, CT scans are 80% to 90% sensitive and 70% to 80% specific. The following findings are suggestive of small bowel obstruction in CT films:

(a) a discrete transition zone with dilatation of bowel proximally,

(b) decompression of bowel distally,

(c) intraluminal contrast that does not pass beyond the transition zone

(d) a colon containing little gas or fluid.

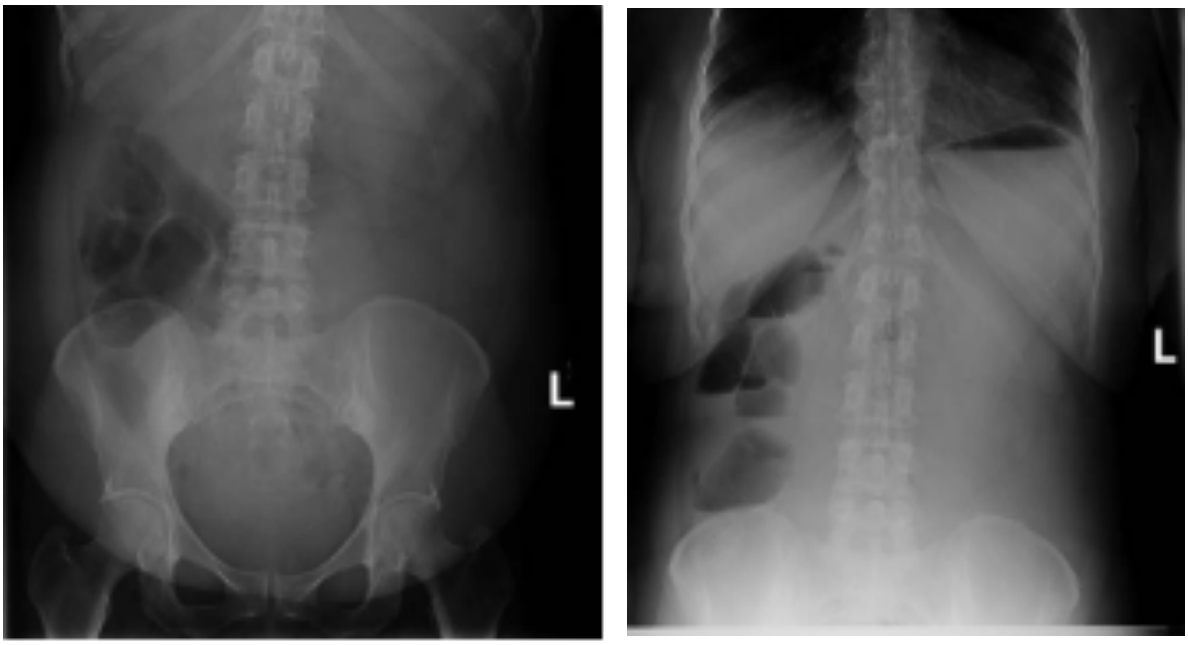


Figure (9) on the left showing dilated bowel lops and that on the right showing air fluid levels both consistent with small bowel obstruction.

Figure 10 shows dilated small bowel loops with decompressed ileum(I) and ascending colon (C) suggestive of distal small bowel obstruction.

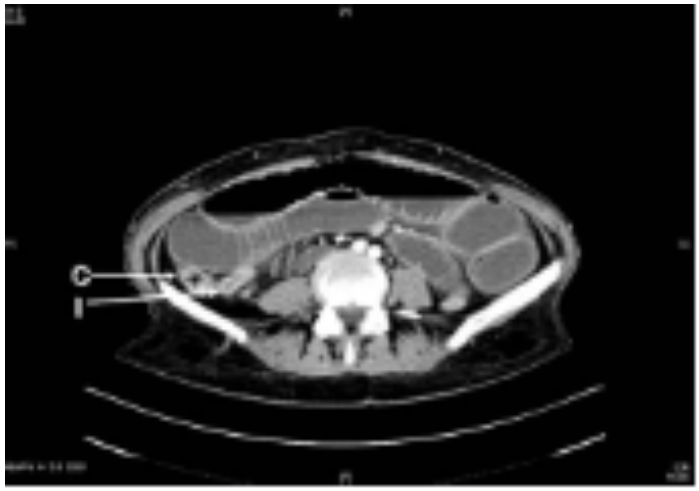
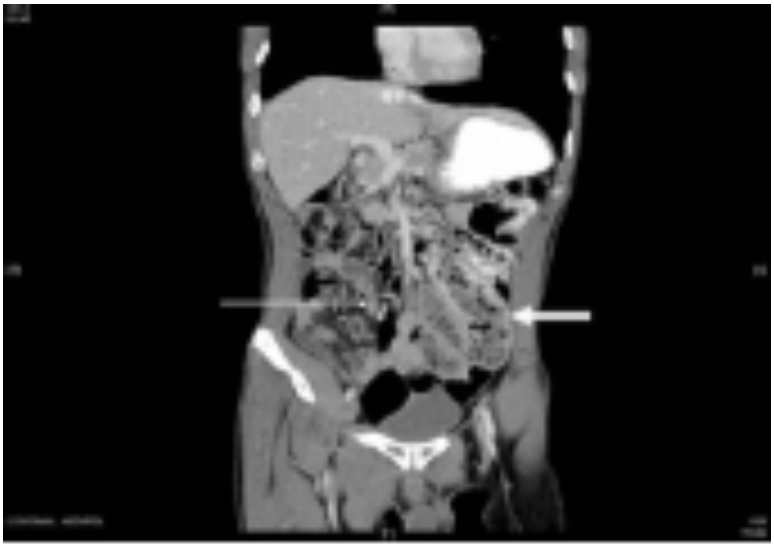


Figure 11.

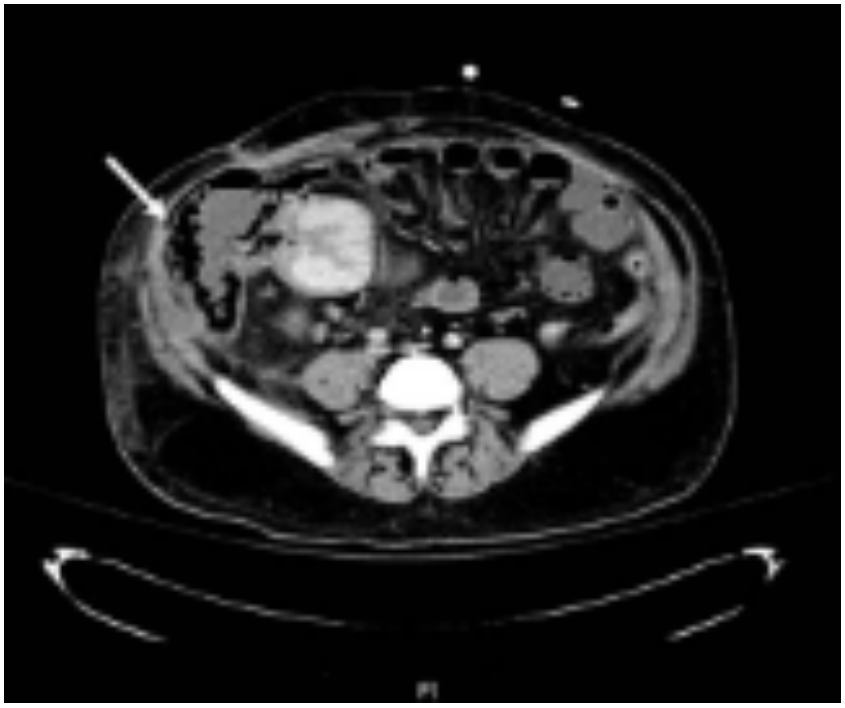
Coronal section shows dilated proximal small bowel loops (wide arrow) and decompressed distal small bowel loops (thin arrow) suggest of chronic small bowel obstruction



CT scans may also be useful in detecting closed loop obstruction and strangulation. Closed loop obstruction is suggested by the presence of a U-shaped or C-shaped dilated bowel loop associated with a radial distribution of mesenteric vessels converging towards a torsion point. Strangulation is indicated by thickening of bowel wall, pneumatosis intestinalis, portal venous gas shadows, mesenteric haziness, and poor uptake of contrast into the wall of the affected bowel. CT scans also shows the entire abdomen and hence helpful in finding out the etiology of obstruction.

Arrow marked in the CT film shows pnematosis intestinalis.

Fig 12



The CT scan is usually performed after administration of oral water-soluble contrast or diluted barium. Both prognostic and therapeutic value is seen using water soluble contrast. Several studies and meta-analysis have shown that

appearance of contrast in colon within 24 hours confirms the non surgical management of small bowel obstruction.

A very important drawback of CT scanning is its low sensitivity (less than 50%) in detecting partial small bowel obstruction. It is very difficult to identify the subtle transition zone in the axial films of CT. In such cases, contrast examination of small bowel using enteroclysis or small bowel series are usually done.

In a standard small bowel series, contrast is usually swallowed or instilled into the stomach through a nasogastric tube. Then a series of X rays are taken till the contrast reaches the intestines distally. Water soluble contrast agents like Gastrograffin should be used if a suspicion of intestinal perforation is present. These studies are more difficult and less commonly performed than the normal CT scanning. In enteroclysis, about 200 to 250ml of barium followed by 1 to 2 litres of methyl cellulose solution in water is instilled into the proximal jejunum through a long nasoenteric catheter. The technique used in enteroclysis is a double contrast technique. It helps assessment in the better assessment of mucosal surface and detection of very small lesions. Enteroclysis is rarely done in acute scenarios even though it provides greater sensitivity in detecting the lesions of small bowel obstruction compared to small bowel series. Of recent times, CT enteroclysis is found to be superior to plain X ray small bowel contrast studies.

CLINICAL FEATURES AND DIAGNOSIS OF MESENTRIC ISCHAEMIA:

Acute mesenteric ischemia is diagnosed on examination as severe abdominal pain out of proportion to the degree of abdominal tenderness. The pain is usually colicky positioning around the middle of the abdomen. Nausea, vomiting and diarrhea may be usually associated with this condition. In the early stages of ischemia physical examination usually proves to be negative. But with the development of bowel infarctions, abdomen distension, peritonitis and passage of bloody stools occurs. Chronic mesenteric ischemia usually has an insidious course. Postprandial abdomen pain is the most important symptom along with aversion to food and weight loss is seen. Many of these patients are asymptomatic due to the presence of extensive collateral venous drainage routes. Hence this condition is most often diagnosed as an incidental finding in imaging studies. Some of the patients presenting with this disease may present as bleeding from esophageal varices.

Patency of the mesenteric vessels can be non invasively assessed by duplex ultrasonography. A peak systolic velocity in the SMA >275cm/sec usually helps in detecting >70% stenosis. Duplex are also used up for the postoperative follow up of the patient. CT with three dimensional reconstruction and MRA are used for radiographic assessment of the mesenteric vessels. The definitive diagnosis is made by biplanar mesenteric angiography. It classically shows occlusion or near occlusion of the celiac artery or superior mesenteric artery at or near their origin

from aorta. Biplanar mesenteric angiogram helps in differentiating the different types of mesenteric arterial occlusion. Mesenteric emboli lodge at the orifice of the middle colic artery, creating a "meniscus sign" with an abrupt cutoff of a normal proximal SMA several centimeters from its origin on the aorta.

In contrast to this mesenteric thrombosis occurs at proximal SMA tapering off at 1-2cm from its origin. Non occlusive mesenteric ischemia produces an arteriographic image of segmental mesenteric vasospasm with a relatively normal appearing main SMA trunk. Mesenteric arteriography also has a therapeutic role. An infusion catheter is kept near the SMA orifice and vasodilators such as papaverine are administered intrarterially. In patients presenting with acute abdomen, arteriography is the gold standard investigation of choice for diagnosing mesenteric occlusive disease. Since it is a time consuming modality, immediate exploration to assess the viability of the intestines and vascular reconstruction is the best choice.

CLINICAL FEATURES AND DIAGNOSIS OF INTUSSUSCEPTION:

The child usually presents with screaming and drawing up of legs. During the attack the child appears pale. Vomiting may or may not occur initially. But with time becomes bilious and conspicuous. Initially the passage of stools may be normal. But later blood and mucus are evacuated giving a characteristic "redcurrant jelly" appearance. Examination should be done between the colicky

episodes. Abdomen is usually not distended. Characteristic emptying of right iliac fossa – the sign of dance may be seen.

On PR, blood stained mucus may be found on the finger. Unrelieved, progressive dehydration and abdomen distension from small bowel obstruction occurs resulting in peritonitis secondary to gangrene.

A plain abdomen film usually reveals small or large bowel obstruction. Claw sign is seen in barium enema films. Ultrasound reveals a typical doughnut appearance of concentric rings in transverse section. CT is more sensitive in diagnosing intussusceptions. The characteristic features of CT scan include a 'target' or 'sausage' shaped soft tissue mass with a layering effect.

CLINICAL FEATURES AND DIAGNOSIS OF LARGE BOWEL OBSTRUCTION:

Signs and symptoms depend on the cause and location of obstruction. Cancers in descending colon and rectum are more like to cause obstruction than those in proximal colon. Large bowel obstruction manifests clinically regardless of cause as failure to pass stools and flatus, increasing abdomen distension and a crampy abdomen pain. Colon becomes distended as gas, stool, liquid accumulate proximal to the site of obstruction. If the cause of obstruction is either a hernia or volvulus, blood supply may be compromised and may lead on to strangulation ending up in gangrene. Initially the venous return is blocked causing localized swelling that can in turn occlude the arterial supply resulting in ischemia. If

uncorrected it leads on to necrosis or gangrene. The strangulation at firsts only involves the entrapped, or incarcerated segment of bowel but the colon proximal to it becomes progressively dilated because of obstruction.

ADHESIONS:

Adhesions and bands are more common causes of intestinal obstruction in western countries. It starts to form within hours of abdominal surgery. Any source of peritoneal irritation results in local fibrin production producing adhesions between apposed surface. Early fibrinous adhesions if not removed becomes vascularised and is replaced by mature fibrous tissue.

Factors that may prevent the formation of adhesions include –

(a) good surgical technique,

(b) washing of the peritoneal cavity with saline to remove clots,

(c) minimizing contact with gauze

(d) covering anastomosis and raw peritoneal surfaces.

Various substances such as hyaluronidase, hydrocortisone, silicon, dextran, chondroitin, streptomycin, etc. have been instilled in the peritoneal cavity to prevent adhesion formation. It is believed that with the advent of laparoscopic surgeries the incidence of adhesions formations may reduce. Postoperative adhesions giving rise to obstruction usually involves the lower small bowel and almost never involves the large bowel.

2.6 TREATMENT:

PRINCIPLES OF MANAGEMENT:

Resuscitation

Nasogastric tube decompression.

Fluid and electrolyte replacement

Relief of obstruction.

Resuscitation:

Patients usually present with severe hypotension and sepsis hence initial resuscitation is of prime importance. Fluid resuscitation with isotonic saline solutions like ringer lactate is administered after securing a wide bore intravenous line. Vitals monitoring and hourly urine output monitoring is of prime importance. Central venous pressure monitoring for elderly patients is necessary to prevent fluid overload with Swan-Ganz catheter. Potassium infusion could be given after adequate urine output.

Routine investigations are sent with special emphasis on Serum electrolytes, hematocrit, white blood cell count. Broad-spectrum antibiotics are given prophylactically based on the reported findings of bacterial translocation occurring following mechanical obstruction. Prophylactic antibiotics are given for possible resection or enterotomy at surgery.

Principles of surgical intervention :

Management of:

1. The segment at the site of obstruction
2. The distended proximal bowel
3. The underlying cause of obstruction

Early Surgical intervention is necessitated if

1. Obstructed external hernia
2. Suspicion of intestinal strangulation
3. Obstruction in a 'virgin' abdomen

Though the clinical advice that 'the sun should not both rise and set' on a case of unrelieved acute intestinal obstruction was widely accepted if there is complete obstruction with no signs of ischemia, resuscitation precedes surgery. If obstruction is likely to be due to adhesions, conservative, ie, nonoperative management may be continued for upto 72 hours expecting spontaneous resolution. But Surgery should be decided early if closed loop obstruction or strangulation is anticipated. Retrospective studies have shown that 12- to 24-hour delay in surgery could be accepted provided there are no signs of strangulation.

During Surgery, adequate exposure is best achieved by a midline incision.

Assessment is directed to:

1. The site of obstruction;
2. The nature of the obstruction and

3. The viability of the gut.

In cases of small bowel obstruction, to access the site of obstruction , initially the distended small bowel is delivered out through the wound. Adequate support to the fluid filled bowel should be given to prevent any compromise to the blood supply to the mesentery and bowel loops should be covered with moist swabs.

Operative decompression:

Operative decompression is performed as early as possible is done so that pressure over the wound decreases reducing pain as well as improving the diaphragmatic movements. Nasogastric tube suctioning is the safest and simplest method to be used so that small bowel contents are milked out in retrograde manner to the stomach for aspiration. Appropriate replacement of fluid for all volumes of fluid removed should be ensured. At the end of the procedure the stomach is ensured empty to prevent postoperative aspiration. Rarely, decompression using Savage's decompressor within a seromuscular purse-string suture may be required. But risk of septic complications from spillage and the risk of leakage from the suture line postoperatively weighed against its advantage.

The type of surgical procedure depends upon the cause of obstruction like Adhesiolysis, excision of diseased segment, bypass procedure or proximal

decompression. The viability of the involved bowel is carefully assessed following relief of obstruction. Except for the frankly infarcted bowel which is obvious, the viability status in many cases may be difficult to decide.

FIG 13. ISCHEMIA AND GANGRENE WITH VIABLE COMPONENTS INBETWEEN

Viability is confirmed by color, sheen and peristalsis. If necessary, the bowel should be wrapped in hot packs for 10 minutes and then reassessed. Pulsation in adjacent arcades and of the mesenteric vessels should be sought. Resection should be the choice if still doubt persists regarding the viability of the

gut but care should be taken that this does not lead to short bowel syndrome. Patient who is in sepsis with inotropic support or likely to require postoperative level 3 intensive care treatment following resection, bowel stomas should be considered rather than anastomoses. This is safe also allowing regular assessment of the bowel. Intestinal ischemia following reperfusion of ischemic bowel reported as reperfusion injury in remote lung injury with the release of inflammatory mediators. Special emphasis is needed in this regard while treating Ischemic bowel.

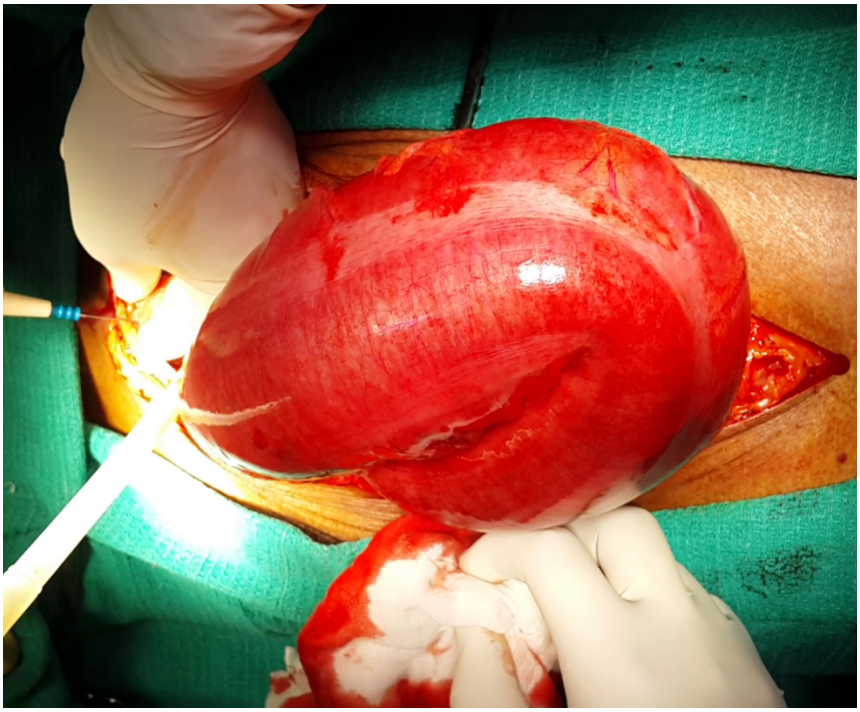


FIG 14. VOLVULUS

In volvulus with established infarction, detorsion is avoided until the affected mesentery is clamped and thus preventing reperfusion injury. A second-look laparotomy at 24–48 hours may be required when multiple ischemic areas are found in the intraoperative period or when no resection attempted.

The surgical management of massive infarction is dependent on the patient's overall prognostic criteria. It should be individualized for every patient depending on various other prognostic factors. The exact site of resection, the length of the resected segment and that of the residual bowel should be recorded every time after resection.

If suspected Malignancy – resection of margin 8 to 10 cm is needed. Endoscopic stent placement is also considered as an option in modern days.

Laparoscopic Approach for small bowel obstruction if ;

- Mild abdominal distension allowing adequate visualization
- Proximal obstruction
- Partial obstruction
- Anticipated single band obstruction

Complications – Operative management:

In small intestine, anastomotic leak is an anticipated complication in post operative period. Though several reasons have been postulated, majority of the leak occurs due to poor technique and unstable general condition of the patient.

Stomas:

In Emergency surgery, stomas better in,

- poor nutritional status of the patient,
- an immunocompromised state, and
- Presence of intra-abdominal contamination/sepsis and obesity.

An ileostomy is an opening constructed between the small intestine and the abdominal wall, usually by using distal ileum, but sometimes more proximal small intestine. The surgical construction of an ileostomy must be more precise than that for a colostomy because the content is liquid, high volume, and corrosive to the peristomal skin. Therefore, the stoma must be accurately located preoperatively, and it must have a spigot configuration to allow an appliance to seal effectively and precisely around the stoma.

Various types of ileostomies can be constructed. The most common has been the end ileostomy, using a technique popularized by Brooke and Turnbull. The loop ileostomy is used, as described, to divert stool away from diseased areas or surgical anastomoses distally. The loop-end ileostomy is a stoma that uses the principles of a loop ileostomy but is constructed as a permanent stoma when the mesentery and its blood supply need special protection.

Determination of Ileostomy Location

The location of the ileostomy must be carefully chosen before surgery. It should avoid any deep folds of fat, scars, bony prominences of the abdominal wall, the inguinal folds, and the waistline crease. The site is chosen by drawing a vertical line through the umbilicus and a transverse line through the inferior margin of the umbilicus and applying a disk the size of a stoma faceplate (approximately 8 cm in diameter) to determine the location. The disk is allowed to abut on both of the lines in the right lower quadrant, and the site is marked with ink. The patient is then brought to an exaggerated sitting position and allowed to turn in various directions to be sure the site is adequate in all positions, and there are no creases or skin folds created by changes of position. If so, the location should be adjusted to bring the stoma to the summit of the infraumbilical fat fold to be sure that there is clearance for fitting of an appliance.

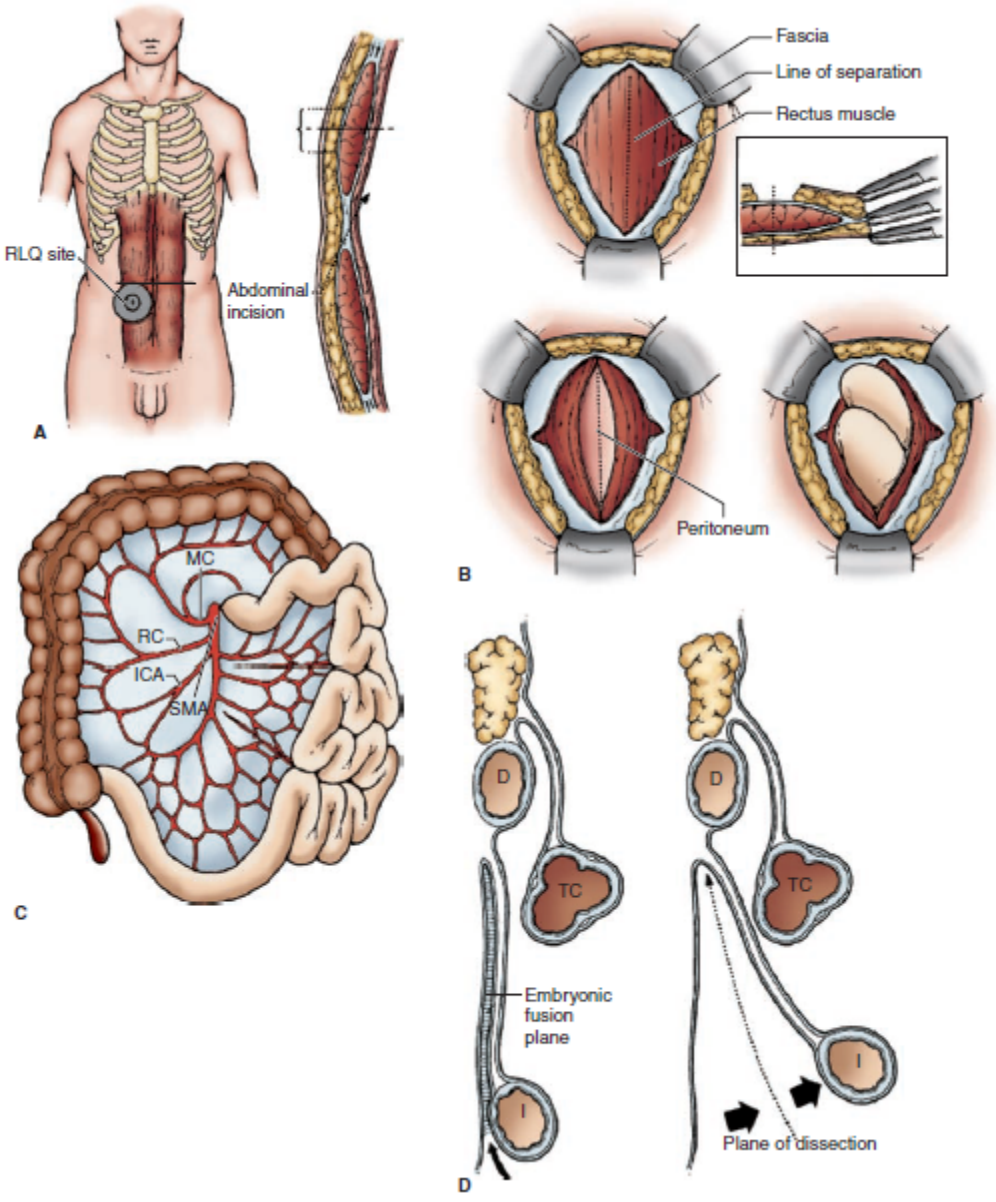


Fig 15. Shows the technique of construction of an Ileostomy.

When the patient is in the operating room and anaesthesia has been administered, the chosen site is scratched with a fine needle before preparation of the abdominal skin is carried out. The majority of complications arising from ileostomies can be avoided by taking these precautions in marking the site for the stoma preoperatively. Even in cases in which the use of a stoma seems remote, the precaution of marking the site preoperatively should be taken. In addition, whenever possible, patients should be seen by a CWOCN and an ostomy visitor so that they can be given information about the stoma and its care.

The visit from an ostomate (someone who has done well with a similar stoma) is helpful because it allows the patient to know that the surgery can be survived and that life can be continued productively and normally with the presence of a stoma. The discussion should avoid excessive details about types of equipment and types of stoma problems during the postoperative period, as this information can be overwhelming to a patient facing complex surgery, often life-threatening disease processes, and the concept of having a stoma. When an ileostomy is anticipated, the choice of abdominal incision is a left paramedian skin incision, slanting the incision to the midline fascia. This gives the advantage of opening the fascia through the midline to provide a simple, effective closure and at the same time preserve all the right lower quadrant peristomal skin for maintenance of the appliance seal.

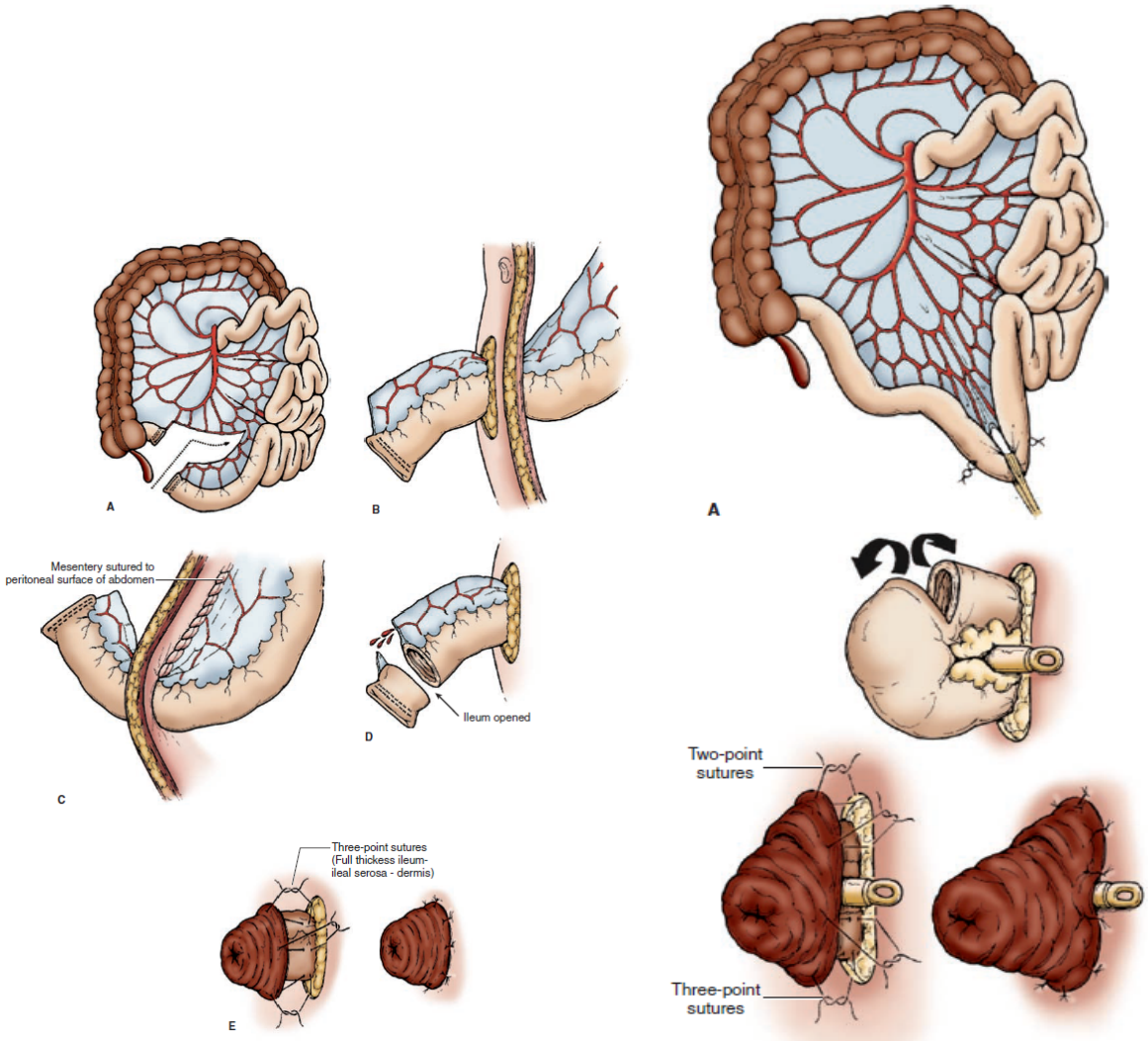


Figure 16 and 17 shows the techniques of End ileostomy and Loop Ileostomy in the emergency situations.

Treatment in specific situations:

Tuberculosis:

Stricturoplasty:

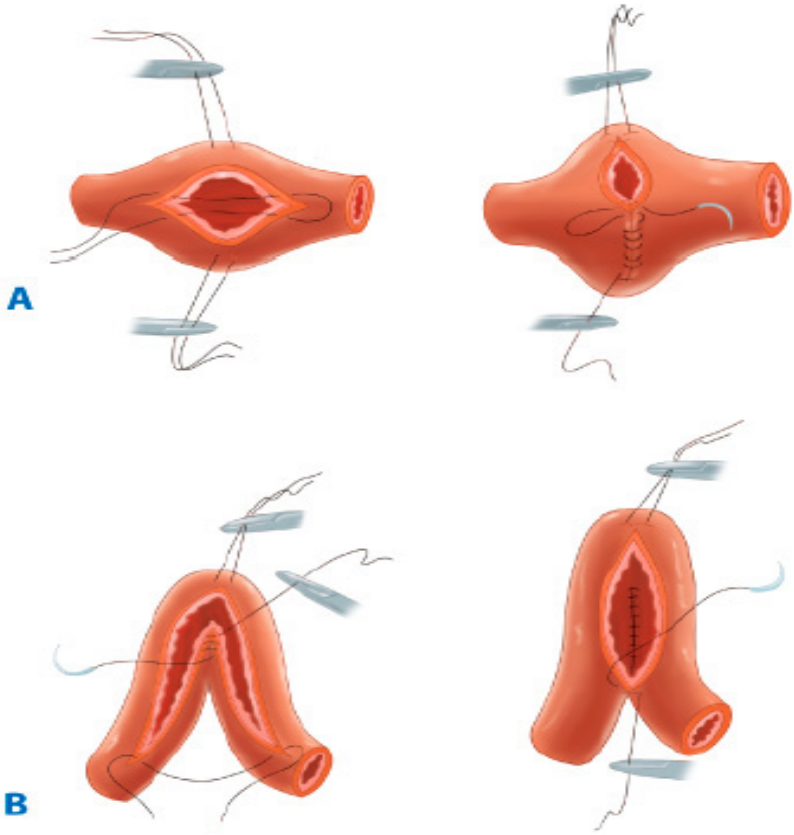


Fig 18 Shows the Technique of Stricturoplasty

TECHNIQUE OF ANASTOMOSES:

A sutured end-to-end small bowel anastomosis is often the first that a trainee surgeon performs. Mobility makes the surgery technically easy, the blood supply is good and breakdown uncommon. As discussed already, the two ends must have a good blood supply and be able to be brought together easily without tension. Discrepancies in diameter between the ends can be adjusted by the spacing of sutures, as the bowel wall is elastic. Alternatively, the smaller-lumened tube can be cut at the antimesenteric border to equalise the diameter. Care should be taken over orientation, because if there is ample mobility, then one end can be inadvertently rotated.

The anastomosis should be undertaken without fear of spillage of contents during the procedure, and non-crushing occlusion clamps may be necessary. They are placed proximally and distally to isolate the area of bowel to be opened from ongoing inflow of gastrointestinal contents until the anastomosis is complete. However, this has the disadvantage of compromising the blood supply, which may be critical to the healing of the anastomosis. Alternatively, a sucker with guard can be introduced into the divided bowel ends and guided up the lumen to clear contents.

Minor bleeding points in the submucosa can be ignored. Precise coagulation diathermy will arrest the more troublesome bleeding points, but many surgeons prefer to divide the bowel with diathermy to reduce bleeding.

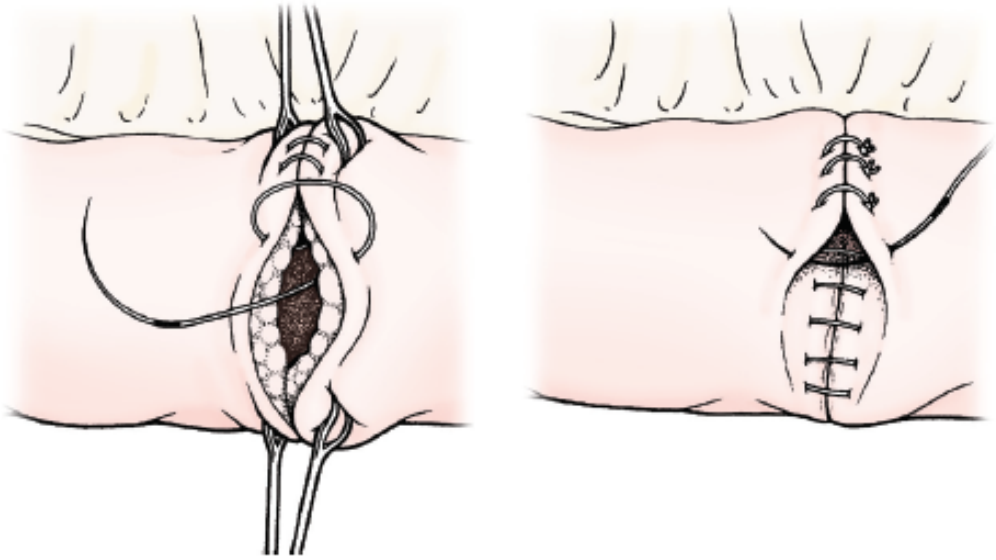


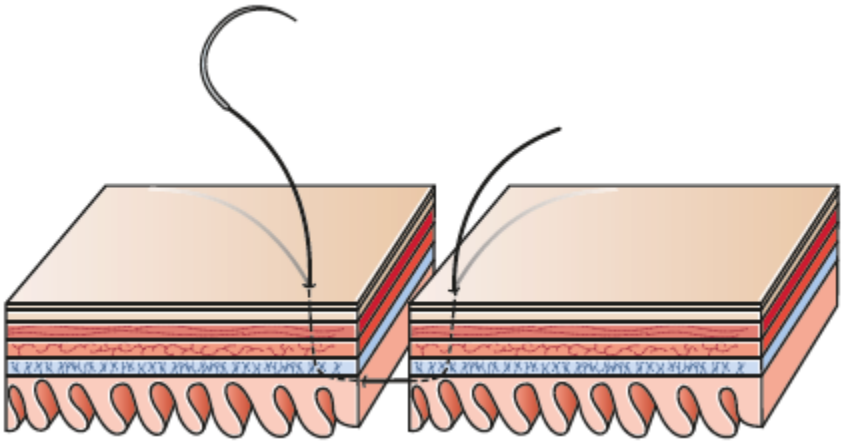
Fig 19. Anastomotic Technique

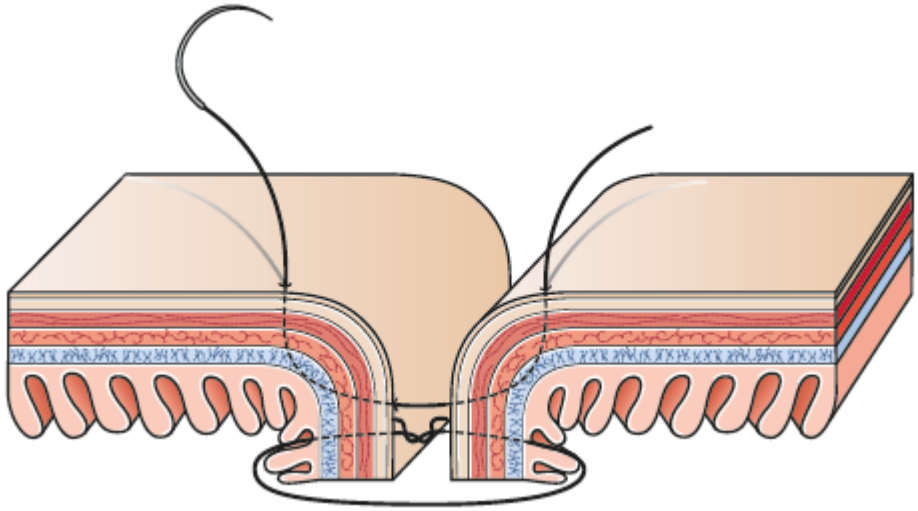
SUTURE MATERIAL

The choice of suture material is often dependent only on the preference of the surgeon; for example, knots may feel more secure with a braided material but a slippery monofilament material slides better if a parachuting technique is needed. Additionally, the choice between an absorbable and a nonabsorbable suture is again often one of personal preference. However, non-absorbable sutures should be avoided in biliary and urinary anastomoses, where sutures – in particular braided material such as silk – have been found as the nidus within a subsequent calculus.

TECHNIQUE

A single layer of interrupted extramucosal sutures is now favoured by the majority of surgeons. A continuous suture acts like a drawstring and will tend to narrow the lumen, especially in the early phase when postoperative swelling further tightens the suture. In addition, a continuous suture reduces the blood supply to the cut ends; this is disadvantageous except in very vascular areas where a haemostatic suture may be beneficial. Sutures that include the mucosa have no advantage other than haemostasis. They do not add significantly to the strength of the anastomosis nor do they improve apposition, as the mucosa already lies in apposition after accurately placed extramucosal sutures. Mucosa heals rapidly, and a watertight seal will have formed within 24 hours. Sutures that include the mucosa merely delay this by the trauma and ischaemia that they cause, and in experimental models, a small mucosal ulcer can be seen at each suture site.





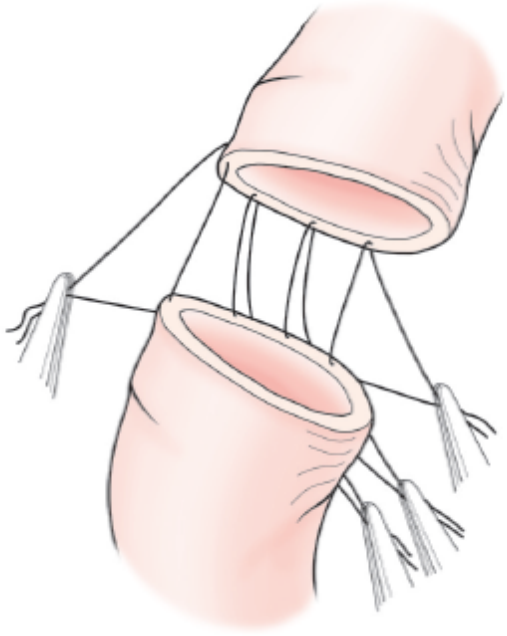
Historically, when two layers of sutures were used routinely, it was believed that the second seromuscular layer was important to invaginate and bury the mucosa of the cut ends. This does not confer any benefit and causes narrowing and greater tissue strangulation. The first two sutures are placed to unite the two ends at the mesenteric and antimesenteric borders, and they divide the anastomosis into two equal sections. These sutures are tied, the ends left long and held in artery forceps. Each suture should start on the outside and emerge between the mucosa and the muscularis mucosa. It is important to include the muscularis mucosa, which is visible as a white line, as it has significant strength. These layers are distinct and mobile on each other if the bowel has been cut with scissors or a scalpel. Diathermy division of the bowel to some extent ‘fuses’ the layers, and the anatomy of the layers may be less distinct.

The ideal size of the suture bite may be difficult to judge. A larger bite has less danger of cutting out, but it creates a larger bulk of potentially strangulated tissue to narrow the lumen. In the adult small bowel a reasonable compromise is to introduce the suture 0.5 cm from the cut end. The suture is then introduced into the other cut bowel end between the muscularis mucosa and the mucosa and brought out through the peritoneal surface (0.5 cm from the cut end). Care must be taken as the throws on the knot are tightened to prevent the whole suture tightening and strangulating the tissue. The spacing of sutures is difficult to judge, and the temptation to place them very close, in anticipation of the dilatation of postoperative ileus, should be resisted. The additional compromise to the blood supply outweighs any benefits of an apparently more watertight early closure. In an adult small bowel, sutures at intervals of 0.5 cm are a satisfactory compromise. Subsequent sutures are placed until half of the anastomosis is complete. The bowel is then turned over and the other half of the anastomosis completed. In most other situations access is less ideal, and it is important to complete the back wall of the anastomosis first.

A similar technique to that described above can be employed if the surgeon starts at the back corner, which is furthest away, and this first suture is left long as a stay suture. This suture makes the placement of the next suture easier, and it is possible to continue along the back wall of the anastomosis until the back corner nearest the surgeon is reached. This last suture is also left long as a stay suture. The

front wall is then anastomosed. Another alternative is to introduce the sutures along the back wall of the anastomosis from within the bowel lumen. These sutures have knots in the submucosal plane, which in theory is less than ideal but in practice is satisfactory.

In a difficult anastomosis, where access is very restricted, sutures may be *parachuted* or *railroaded* into position. The two ends are only apposed after all sutures are in place. Many of these problems, which are encountered particularly in oesophageal and rectal anastomoses, can be overcome by use of a circular stapling device. In some structures, such as the common bile duct, a separate mobile mucosa may not be apparent. The interrupted sutures should then be placed full thickness if it is not practical to exclude the mucosa.



Different suturing used in bowel are:

Single layer seromucosal suture of bowel:

It is now well practiced method of suturing of the bowel. Interrupted seromucosal sutures using three zero/two zero vicryl or PDS takes up well. Nonabsorbable silk or linen can also be used. *These nonabsorbable sutures are good old suture materials which are even now accepted well*. Only drawback presumed is formation of suture granuloma at the anastomotic site.

Gambee single layer full thickness (all layers) sutures using vicryl are also used in bowel anastomosis. It can also be used as continuous sutures especially during gastrojejunostomy.

Continuous suturing is quicker; alternate bites should be locked to prevent purse string effect; anterior layer is closed with inverting sutures.

Interrupted suture is more stable and stronger with less chances of anastomotic disruption. It also maintains the blood supply better than continuous sutures. Width of suture bite taken should be less over mucosal part than seromuscular part. Bites are taken 3 mm from the cut edge of the serosa; each bite is taken in a 5 mm gap

Lembert suture:

It is the commonly used seromuscular suture. Silk 3 zero or vicryl 3 zero is used. Deep seromuscular suture including submucosal layer is taken at a point 5 mm from the cut edge of the serosa; this bite emerges at same line (2 mm) from the cut closer edge of serosa; bite is taken on the opposite part of the bowel at 2 mm

from the serosal cut edge as seromuscular which emerges at 5 mm point away in the same longitudinal line and knot is placed. It can be used as continuous suture also.

Cushing suture:

It is similar to Lembert suture wherein seromuscular bites are taken parallel to the cut edge of the serosa (at 2 mm from the cut edge). Thickness of tissue taken is 5 mm. Both interrupted and continuous sutures can be taken.

Halsted suture:

It is actually seromuscular horizontal mattress suture. Care must be taken to avoid excessive tension over the suture line as this may lead in to ischemia of the anastomotic site.

Connell suture:

Here suture material passes through all the layers of the intestine from serosa to mucosa; again brought out through all layers of the intestine on the same side from mucosa to serosa; passed over opposite segment of the bowel; passing from serosa

Resection for gangrenous bowel should be done with division of mesentery very close to the bowel wall. In *small bowel tumour* mesentery is divided away at main branch vessel level with adjacent mesenteric

lymph node clearance.

Any serosal tear during small bowel surgery should be invaginated transversely using interrupted silk sutures. It prevents adhesion formation and possible chance of post-operative perforation from serosal tear site.

Risk factors affecting Anastomoses:

DEFINITIVE FACTORS	IMPLICATED FACTORS
Technical aspects: Blood supply Tension on the suture line Airtight and water-tight anastomosis	Mechanical bowel preparation Drains Advanced malignancy Shock and coagulopathy
Location in the gastrointestinal tract: Pancreaticoenteric Colorectal Above the peritoneal reflection Below the peritoneal reflection	Emergency surgery Blood transfusion Malnutrition Obesity Sex
Local factors: Septic environment Fluid collection	Smoking Steroid therapy Neoadjuvant therapy
Bowel-related factors: Radiotherapy Compromised distal lumen Crohn's disease	Vitamin C, iron, zinc, and cysteine deficiency Stapler-related factors: Forceful extraction of the stapler Tears caused by anvil or gun insertion Failure of the stapler to close

Stoma Complications:

CATEGORY	COMPLICATION	
	Early	**Late**
Stoma	Poor location	Prolapse
	Retraction [*]	Stenosis
	Ischemic necrosis	Parastomal hernia
	Detachment	Fistula formation
	Abscess formation [*]	Gas
	Opening wrong end	Odor
Peristomal skin	Excoriation	Parastomal varices
	Dermatitis [*]	Dermatoses
		Cancer
		Skin manifestations of inflammatory bowel disease
Systemic	High output [*]	Bowel obstruction
		Nonclosure

Chapter 3

MATERIALS AND METHODS

MATERIALS AND METHODS

3.1 Type of study : Prospective and Retrospective Observational Study

3.2 Study approval : Prior to commencement of this study - Thesis & Ethical Committee of Madras Medical College and Rajiv Gandhi Government General Hospital, chennai had approved the thesis protocol.

3.3 Place of study : Rajiv Gandhi Government General Hospital

3.4 Period of study : Duration starting from August 2014 to July 2015

3.5 Sample size : 50 cases

3.6 Selection of patients:

a) **Sampling method-** Purposive**.**

b) **Inclusion criteria-** Patients who undergo any emergency laparotomies for ileocaecal involvement.

c) **Exclusion criteria - -**

a) Patients having appendicular pathology.

b) Elective ileocaecal surgeries

3.7 AIMS AND OBJECTIVES

1. To study the various etiologies and the mode of presentation in patients undergoing emergency laparotomies due to ileocaecal involvement
2. To find the commonest procedure performed and its relation with the cause
3. To assess the various factors which affect the post op morbidity and mortality
4. To assess the post operative morbidity and mortality and its relation to cause and type of procedure performed.

3.8 Study procedure:

Method of sampling was non-random, purposive. After admission short history was taken and physical examination was conducted on each patient admitted in surgery department with features of perianal fistula Baseline investigations, as rotiunely required, were done followed by imaging studies. Patients were then explained about their diseases process and the possible line of management. All the necessary information regarding the study was explained to the patients or their valid guardian. Informed written consent was taken from the patients or their guardian willing to participate in the study. Detailed history was taken from the study group to establish proper diagnosis. Thorough physical

examination was done in each case. Data collection sheets were filled in by the investigator himself. All of the preoperative factors related to the patient were noted down in the data sheet. After proper evaluation and preparation, patients who required surgical management were taken up for surgery. Strict aseptic precautions were followed during the operation. Meticulous technique were practiced asa far as possible. The operation procedure and related peroperative factors were observed directly and recorded in the data collection sheet instantly. After completing the collection of data it was complied in a systematic way.

3.9 Variables studied:

i. Age

ii. Sex

iii. Co-morbidities: COPD, jaundice, diabetes, obesity and malnutrition

iv. Chest Xray.

v. MRI Fistulogram

vi. Transrectal Ultrasound

vii. Blood parameters

viii. Types of operations

ix. Post operative complications

x. Histopathological Examination

3.10 Ethical consideration

All the patients/ legal guardians were given an explanation of the study and about the investigative and operative procedures with their merits and demerits, expected results, and possible complications. If he/she agreed then the case had been selected for this study. The study did not involve any additional investigation or any significant risk. It did not cause economic burden to the patients. The study was approved by the institutional review board prior to commencement of data collection. Informed consent was taken from each patient/guardian. Data were collected by approved data collection form.

3.11 Data collection

Data were collected by pre-tested structured questionnaire. Data were collected from all the respondents by direct interview after getting informed written consent from them or from their legal guardian.

3.12 Data analysis

Data analysis was done both manually and by using computer. Calculated data were arranged in systemic manner, presented in various table and figures and statistical analysis was made to evaluate the objectives of this study with the help of Statistical Package for Social Science (SPSS).

CHAPTER 4

RESULTS

RESULTS

This descriptive and observational study was carried out to determine the etiopathological factors and the prognostic factors among patients undergoing emergency laparotomies for ileocaecal emergencies. Fifty patients fulfilling the inclusion criteria from Surgery department of Madras Medical College and Rajiv Gandhi Government General Hospital during the period of August 2014 to July 2015 were selected. All cases were evaluated clinically. Only essential investigations necessary for diagnosis and preoperative assessment were carried out before operations. All patients underwent surgery as warranted in their case. The patients of both sexes and different ages were included in the study. The results obtained are as follows.

Table 1 : Age and Sex Distribution of patients

Age / Sex	Male	Female	Total
18 - 29	8	4	12 (24)
30 - 39	5	1	6 (12)
40 - 49	8	3	11 (22)
50 - 59	5	1	6 (12)
> 60	8	7	15 (30)
Total	34 (68)	16 (32)	50 (100)

* Figures in parentheses indicates percentages

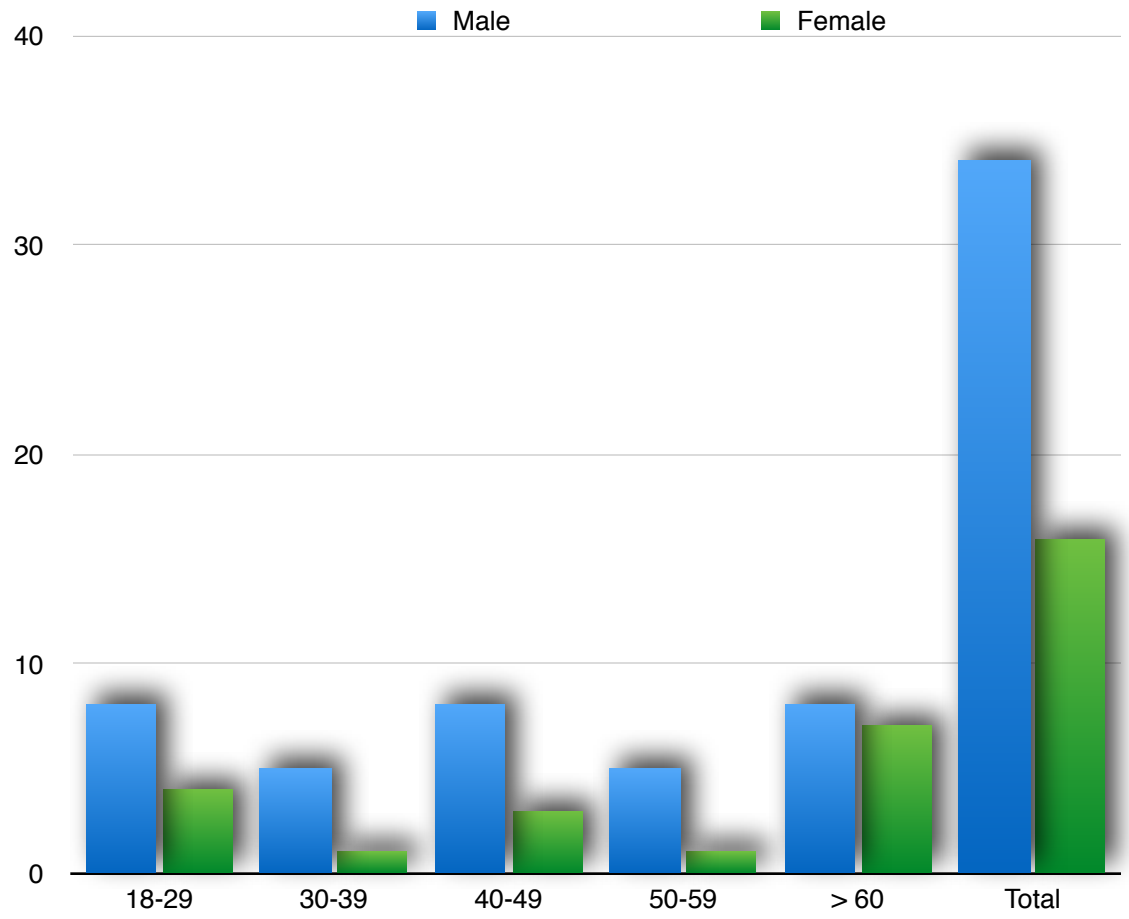


Table 2 : Prevalence of Comorbid Factors in patient group

Co Morbid Factor	Number	Percentage
Diabetes Mellitus	5	10
Hypertension	3	6
DM & HTN	3	6
TB / BA/ COPD	5	10
CAD	3	6
No Comorbidity	31	62
Total	**50**	**100**

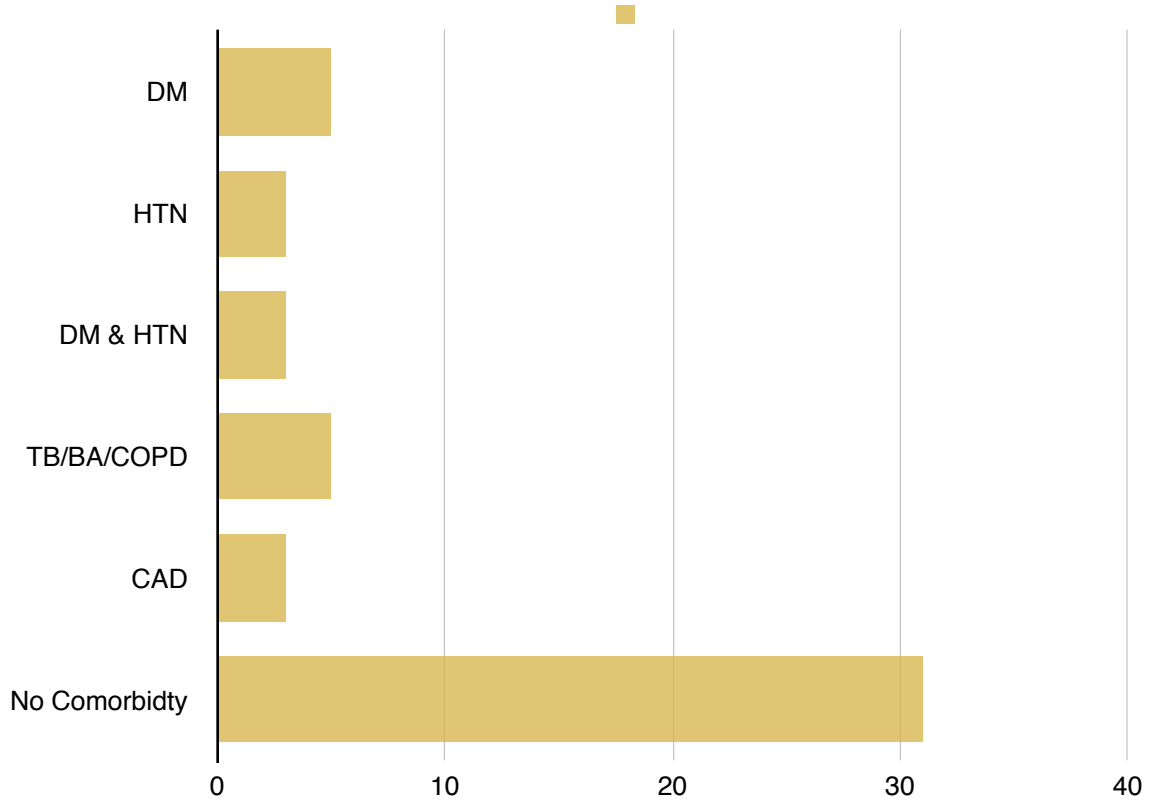


Table 3 : Diagnosis of patients who underwent emergency laparotomies

	Numbers	Percentage
Acute Intestinal Obstruction	8	16
Blunt Injury Abdomen	4	8
Carcinoma Colon	9	18
Small Bowel Perforation	17	34
Large Bowel Perforation	1	2
Obstructed Hernia	10	20
SMA Thrombosis	1	2
Total	**50**	**100**

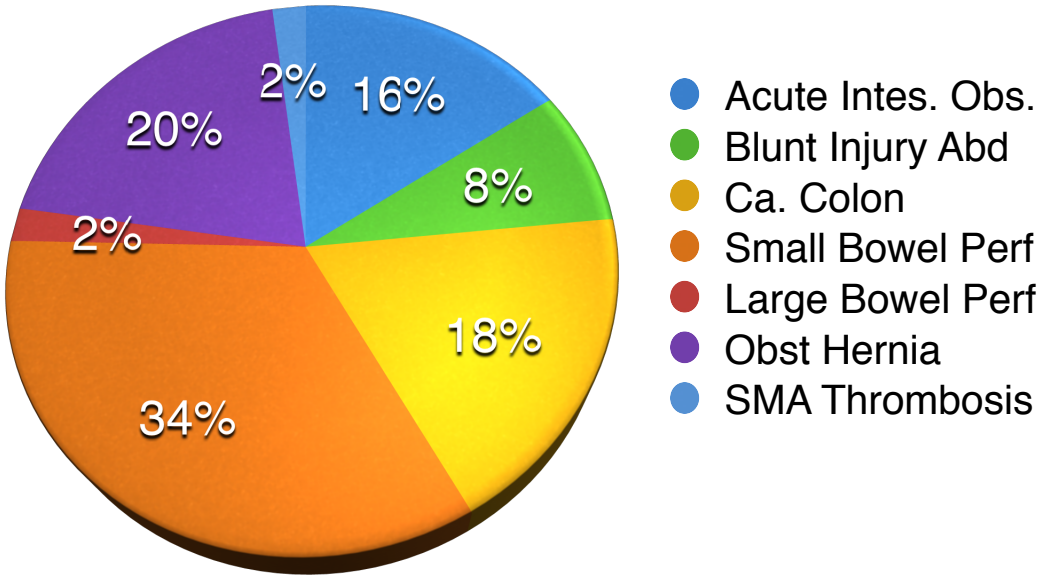


Table 4 : Analysis of Vital Parameters in patient group

Parameters	Within Range		Outside Range	
	Number	Percentage	Number	Percentage
SBP	27	54	23	46
PR	14	28	36	72
Hb	47	94	3	6
TC	33	66	17	34
Urea	23	46	27	54
Na +	47	94	3	6
K +	38	76	12	24
Albumin	44	88	6	12

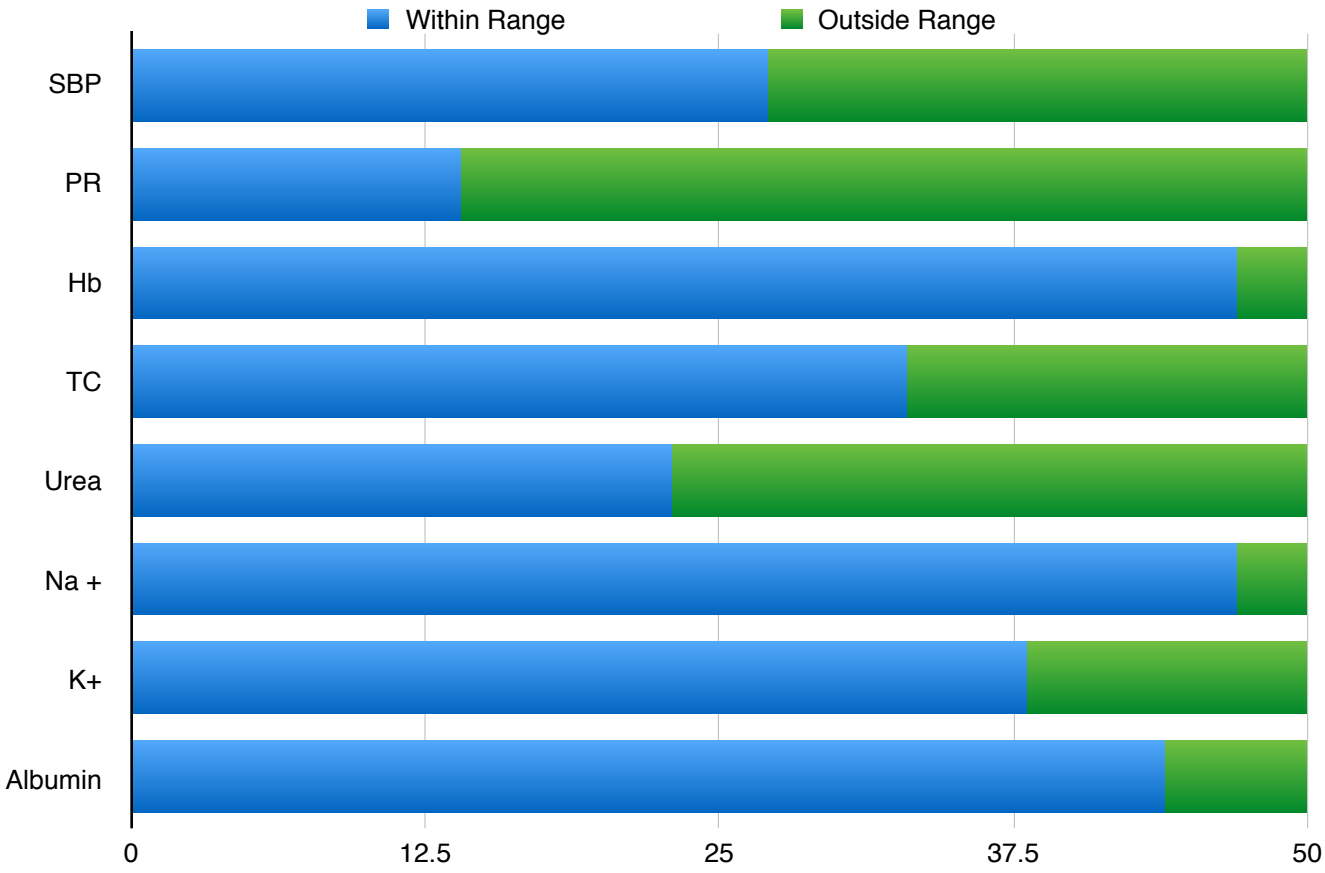


Table 5 : Distribution of Lag period and Duration of Surgery

		Numbers	Percentage
Lag Period	< 24 hours	14	28
	24 - 48 hours	13	26
	48 - 72 hours	8	16
	> 72 hours	15	30
Duration	1 - 2 hours	33	66
	> 2 hours	17	34

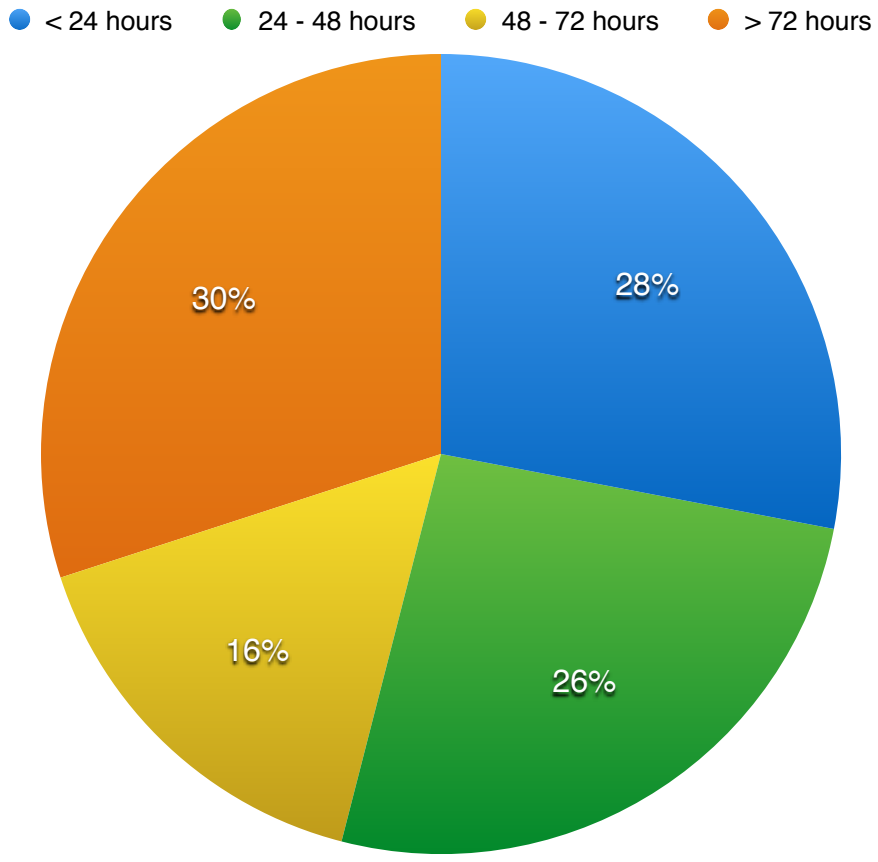


Table 6 : Distribution of causative factors

	Numbers	Percentage
Infection	17	34
Trauma	5	10
Malignancy	8	16
Misc	20	40
Total	**50**	**100**

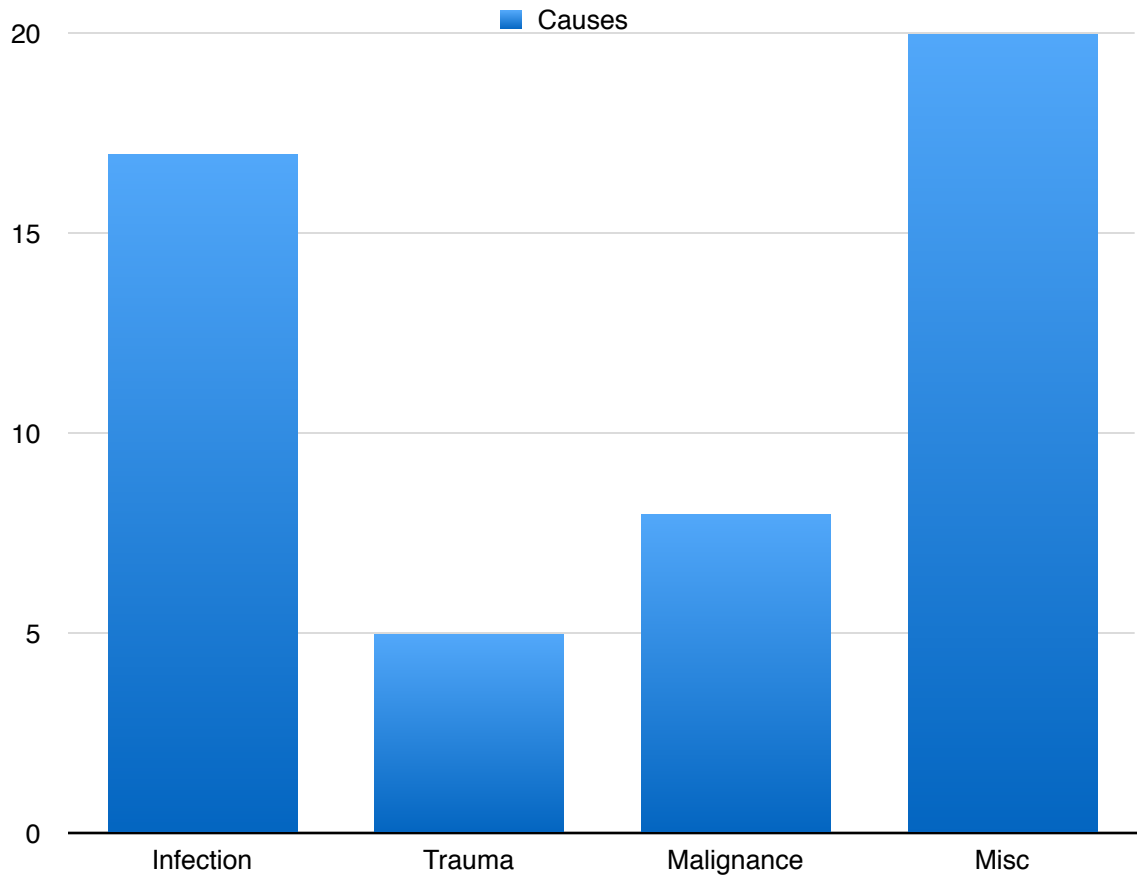


Table 7 : Distribution of Procedure underwent by patients in the Study

	Numbers	Percentage
Primary Closure	7	14
Primary Closure with Loop Ileostomy	1	2
Resection & Anastomosis	19	38
Resection & Anastomosis with Covering Stoma	11	22
End Ileostomy	6	12
Double Barrel Ileostomy	3	6

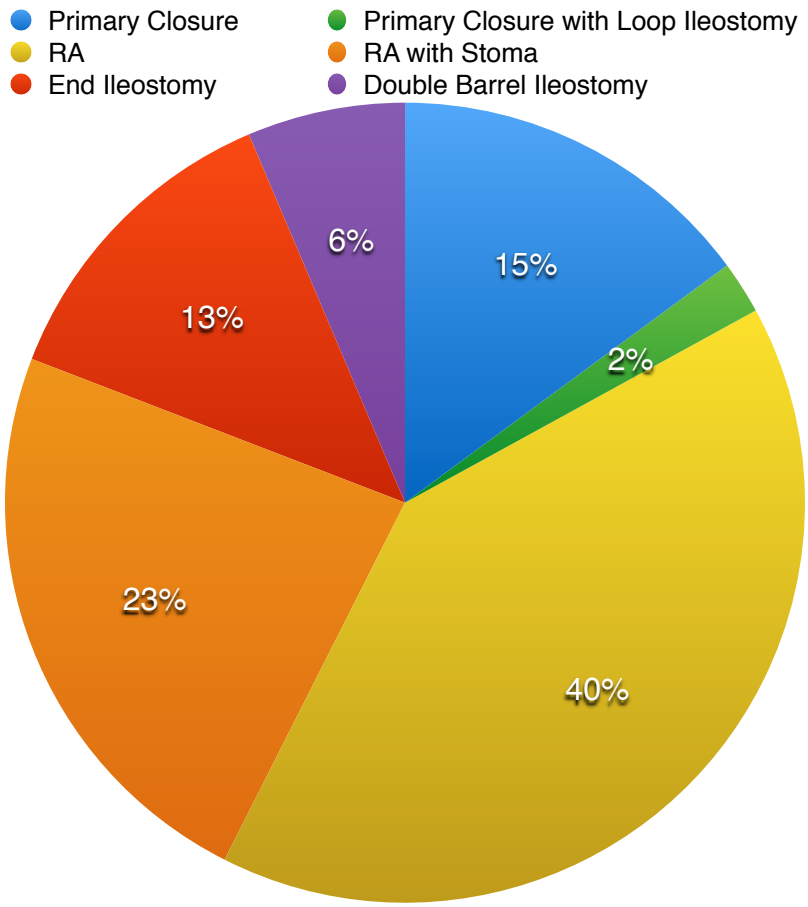


Table 8 : Prevalence of Morbidity among the patient group

	Numbers	Percentage
Anastomotic Leak	4	8
Basal Atelectasis	4	8
Pulmonary Embolism	1	2
Dyselectrolytemia	3	6
Wound Dehiscence	6	12
Wound Infection	4	8
Deep venous thrombosis	2	4
No Morbidity	26	52
Total	**50**	**100**

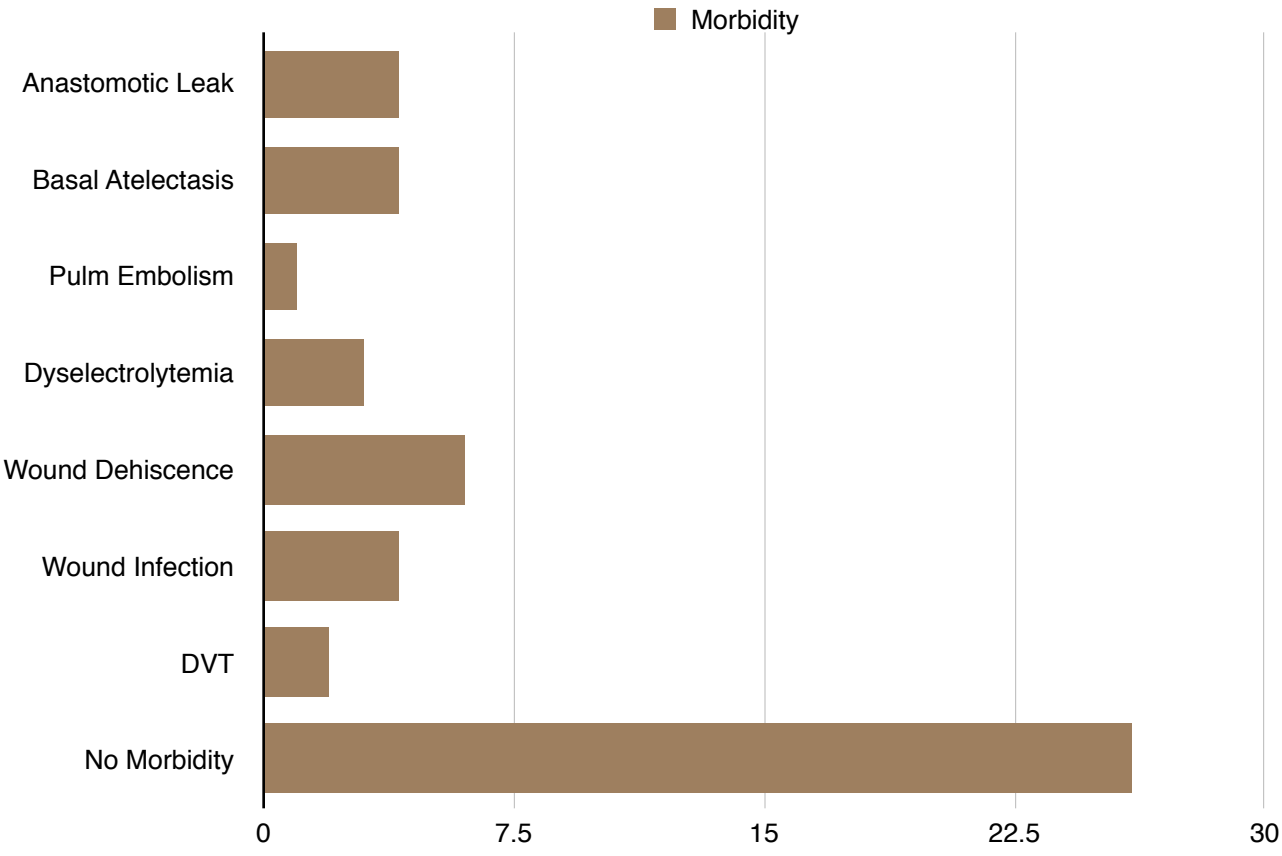


Table 9 : Prevalence of Mortality Among Patient Group

	Numbers	Percentage
MODS	5	10
ARDS	2	4
Sepsis	1	2
Alive	42	84
Total	**50**	**100**

Table 10 : Distribution of mortality and morbidity with cause

	Morbidity	Mortality
Infection	8	2
Trauma	4	1
Malignancy	1	0
Misc	11	5
Total	**24**	**8**

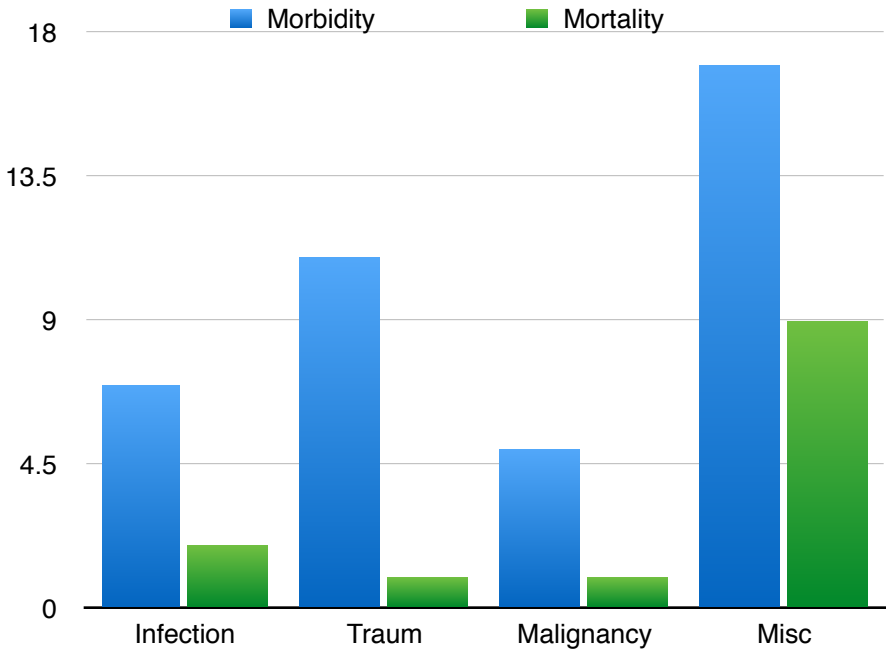
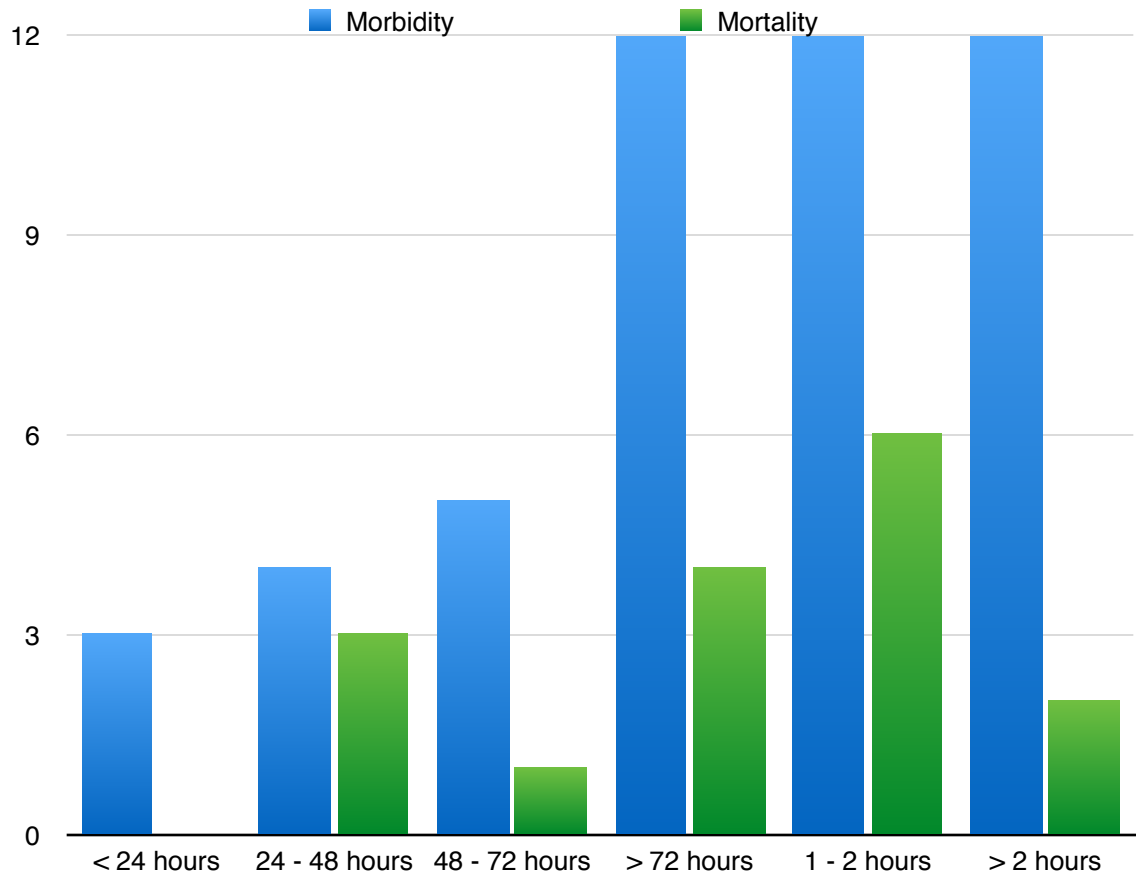


Table 11 : Distribution of Lag period and Duration of Surgery with Morbidity and Mortality

		Morbidity	Mortality
Lag Period	< 24 hours	3	0
	24 - 48 hours	4	3
	48 - 72 hours	5	1
	> 72 hours	12	4
Duration	1 - 2 hours	12	6
	> 2 hours	12	2



CHAPTER 5

DISCUSSION

DISCUSSION OF RESULTS

This descriptive and observational study was carried out to determine the etiopathological and prognostic factors in patients undergoing emergency laparotomies for ileocaecal emergencies and the associated morbidity and mortality. Fifty patients fulfilling the inclusion criteria from Surgery department of Madras Medical College and Rajiv Gandhi Government General Hospital during the period of August 2014 to July 2015 were selected.

Age of 50 patients ranged from 18-78 years. The patients were nearly equally distributed among all the age groups with slightly more preponderance in people over 40 years of age. The male to female ratio was ~ 2 : 1. So, it can be assumed that males are the predominantly involved group.

On analysing the comorbid factors, as expected, Diabetes Mellitus was the predominant comorbid factor, seen in 5 patients (10%), with systemic hypertension seen in three patients (6%). Other factors like CKD, CAD etc was seen in another eleven patients.

On evaluation of patients, eight patients presented with acute intestinal obstruction while four people presented with blunt injury abdomen. Small bowel perforation was seen in seventeen percent of the patients and was one of the

leading cause of ileocaecal emergencies. Obstructed hernia, Carcinoma Colon and SMA thrombosis with bowel gangrene being the other common indications for ileocaecal emergencies in our study.

An analysis of the vital parameters, when the patient presented to the emergency department, showed that as expected more than 70% of patients had tachycardia while nearly forty six percent of the patients had systemic hypotension. Elevated total count indicative of peritonitis was seen in seventeen patients (34%) while evidence of pre-renal failure, indicated by elevated urea levels was seen in more than 50% of patients. Around twenty five percent of the patients had electrolyte abnormalities.

With regards to lag period between onset of symptoms and time of surgery, twenty eight percent of the patients had surgery within 24 hours, while twenty six percent of patients were operated within 48 hours and sixteen percent were operated on third day. More significantly, a huge number of around 30 percent had a more than seventy two hours delay since onset of symptoms before they underwent surgery.

Sixty six percent of the surgeries got over within two hours while the remaining thirty four percent took more than two hours.

An analysis of the causative factors showed that in seventeen (34%) cases infections like typhoid, TB causing perforations as the basic cause. Typhoid was seen in seven patients and TB in four patients. Typhoid perforations still remains a major cause of small bowel perforations while TB is a fast increasing in incidence. Blunt trauma to the abdomen is the cause in five patients. Malignancy of the caecum was the cause in eight patients. Miscellaneous causes including obstructed hernia and SMV thrombosis accounted for the remaining twenty patients.

Regarding the procedures performed, seven patients (14%) had primary closure of their ileal perforations, with nineteen patients (38%) having resection of the obstructed or perforated segment of ileum with anastomosis of the cut ends. Resection anastomosis with a covering stoma was done in around eleven patients (22%). Another six patients had resection with end ileostomy while three patients had resections with proximal ileostomy and distal mucous fistula.

Forty patients developed post operative complications, most common being being wound site involvement either in the form of wound dehiscence or wound infection. Wound dehiscence was seen in six patients while wound infection was seen in four patients. Pulmonary involvement was seen in five patients which included, basal atelectasis and pulmonary embolism. Anastomotic Leak was seen

in only four patients. Two patients had deep venous thrombosis. And three other patients had dyselectrolytemia, seen in patients with stoma.

Eight patients died in the postoperative period. Five due to MODS, two due to ARDS and one due to sepsis. Most of the morbidity and mortality was seen in the miscellaneous group.

With regards to lag period as expected patients presenting more than seventy two hours after the onset of symptoms had the maximum amount of morbidity and mortality accounting for more than fifty percent of all cases. There was not any significant difference between the two groups of patients with regards to duration of surgery, indicating that initial delay is more of a significant prognostic factor.

LIMITATIONS OF THE STUDY

As this study has been carried out over a limited period of time with a limited number of patients and there was lack of financial and infrastructural support, it could not have been large enough to be of reasonable precision. The follow up period was not long enough to comment about long term morbidity and mortality. More number of patients undergoing emergency laparotomies need to be studied. All the facts and figures mentioned here may considerably vary from those of large series covering wide range of time, but still then, as the cases of this study were collected from a tertiary level hospital in our country, this study has some credentials in reflecting the facts regarding prevalence of ileocaecal emergencies and its varied causes and complications associated with it.

SUMMARY

Ileal perforations due to infections and trauma are the main cause of emergency surgeries of ileocaecal region in developing countries like India. It poses a great dilemma in decision making and the management protocols are also not defined. The increasing incidence of vascular anomalies in younger age groups and closed loop obstruction due to malignancies add to this burden. Moreover there is no clear cut data on the prognostic factors and the clinicoepediomology of the disease process. This study tries to throw a light on few of those factors

Age and Sex Distribution :

Malignant obstruction in older age groups form a significant proportion of cases whereas rheological abnormalities seen in middle age groups. The preponderance of male patients can be explained by the fact that by nature they are the predominant gender and greater involvement in motor vehicle accidents. The presence of additional risk factors like smoking, etc also shift the gender bias towards males

Co Morbid Factors :

Diabetes Mellitus is the prevalent comorbid factor, seen especially in the elderly. Other comorbid factors include hypertension, tuberculosis, COPD etc. None of these seemed to have a significant correlation with the disease process.

Management :

In emergency setting, midline laparotomy to relieve the patient of his

symptoms is the first goal. The common procedures performed included primary closure of perforation incase of small isolated perforations with not much contamination. Resection followed by either anastomosis or stomas was done in most of the patients with malignant obstruction or non viable or ischemic bowel. Even in those patients who had anastomosis, a covering stoma was placed as the healing process in these patients may be impaired.

Morbidity or Mortality :

The prevalence of morbidity in these patients were similar to any group of patients undergoing emergency laparotomy. The single most important predictor of the morbidity seems to be the initial lag period between the onset of symptoms and when the patients are taken up for surgery. Presence of a systemic disease, poor general habitus, inadequate optimization all have known to increase the tendency to develop post operative morbidity and mortality. Overall, prognosis is good in patients provided with early intervention, intensive post operative management while ensuring proper psychological support.

RECOMMENDATIONS

On the basis of the findings of the study, the following recommendations can be made:

- Abdomen injuries due to blunt trauma and acute bowel pathologies leading to peritonitis such as bowel perforations are the leading causes of ileocaceal emergencies
- More the lag period from the onset of symptoms/trauma to theatre, more is the incidence of morbidity as well as mortality.
- Post operative patient education and counselling is of utmost importance as there is no hope for prior sensitization in emergency settings
- Adequate hydration, electrolyte correction, nutrition management and psychological support teams play a crucial role in bringing significant number of patients for reversal.

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APPENDIX - I : ETHICAL COMMITTEE CLEAREANCE

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI-3

EC Reg No.ECR/270/Inst./TN/2013
Telephone No. 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr. MURUGANANDAM S
Postgraduate MS (General Surgery)
Madras Medical College
Chennai 600 003

Dear Dr. MURUGANANDAM S

The Institutional Ethics Committee has considered your request and approved your study titled **"A Study on Clinicopathology, Prognostic factors and its relation with outcome in patients undergoing Emergency Laparotomy for Ileocaecal Emergencies." No.07082015.**

The following members of Ethics Committee were present in the meeting held on 04.08.2015 conducted at Madras Medical College, Chennai-3.

1.	Prof.C.Rajendran, M.D.,	: Chairperson
2.	Prof.R.Vimala, M.D., Dean, MMC, Ch-3	: Deputy Chairperson
3.	Prof.Sudha Seshayyan, M.D., Vice-Principal, MMC, Ch-3	: Member Secretary
4.	Prof.B.Vasanthi, M.D., Professor Pharmacology, MMC	: Member
5.	Prof.A.Rajendran, M.S., Professor, Inst.of Surgery, MMC	: Member
6.	Prof.Saraswathy, M.D., Director, Inst. Of Pathology, MMC	: Member
7.	Prof.Srinivasagalu, Director, Inst.of Inter Med. MMC	: Member
8.	Tmt. J.Rajalakshmi, J.A.O. MMC, Ch-3	: Lay Person
9.	Thiru S.Govindasamy, B.A., B.L.,	: Lawyer
10.	Tmt.Arnold Saulina, M.A., MSW.,	: Social Scientist

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary, Ethics Committee

Appendix-II

QUESTIONAIRE

PATIENT DETAILS:

Name: Age: Sex:

IP No. :

ON ADMISSION:

Main Complaints :

Abdominal Pain :

Bowel Habits :

Constitutional Symptoms :

Co – Morbid Illness :

Significant Past History :

Family / Exposure History :

CLINICAL EXAMINATION:

Pulse : BP :

RR : Temp :

Pallor : Icterus :

CVS : RS :

P/A :

INVESTIGATIONS :

CBC : ESR :

Liver Function Test : Renal Function Test :

Mantoux : Sputum AFB :

CXR : Xray LS Spine

Abdomen Xray : USG Abdomen :

CECT Abdomen :

TREATMENT

OPERATIVE DETAILS :

Indication :

Intra Op findings :

Post op Period :

Biopsy (if done) :

FOLLOW UP :

INFORMATION SHEET

TITLE : **"A study on clinicopathology, prognostic factors in patients undergoing emergency laparotomy for ileocaecal emergencies"**

Name of Investigator : Dr. Muruganandam S. Name of Participant :

Purpose of Research : The purpose of the study is to analyse the various modes of presentation of ileocaecal emergencies, the common surgeries performed and the outcome of the surgery

Study Design : Prospective & Retrospective Observational Study

Study Procedures : Patient will be subjected to routine investigations, Xray, Usg, CECT Abdomen,& Operative Procedure as indicated, Biopsy, if done and the data analysed

Possible Risks : No risks to the patient

Possible benefits

To patient : A better understanding of their problem so has to devise a plan of management which suits their needs.

To doctor & to other people : If this study gives positive results, it can help determine the early identification, most effective diagnostic and treatment protocol for patients with abdominal tuberculosis. This will help in providing better and complete treatment to other patients in future.

Confidentiality of the information obtained from you : The privacy of the patients in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared

Can you decide to stop participating in the study : Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time

How will your decision to not participate in the study affect you : Your decision will not result in any loss of benefits to which you are otherwise entitled.

Signature of Investigator Signature of Participant

Date :

Place :

PATIENT CONSENT FORM

Study Detail	:	**"A study on clinicopathology, prognostic factors in patients undergoing emergency laparotomy for ileocaecal emergencies"**
Study Centre	:	Rajiv Gandhi Government General Hospital, Chennai.
Patient's Name	:	
Patient's Age	:	
In Patient Number	:	

I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask question and all my questions and doubts have been answered to my complete satisfaction. ❑

I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason, without my legal rights being affected. ❑

I understand that sponsor of the clinical study, others working on the sponsor's behalf, the Ethics committee and the regulatory authorities will not need my permission to look at my health records, both in respect of current study and any further research that may be conducted in relation to it, even if I withdraw from the study I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from this study. ❑

I agree to take part in the above study and to comply with the instructions given during the study and faithfully cooperate with the study team and to immediately inform the study staff if I suffer from any deterioration in my health or well being or any unexpected or unusual symptoms. ❑

I hereby consent to participate in this study ❑

I hereby give permission to undergo complete clinical examination and diagnostic tests including hematological, biochemical, radiological tests and to undergo treatment ❑

Signature/thumb impression

Patient's Name and Address:

Signature of Investigator

Study Investigator's Name:

Dr. Muruganandam S.,

Appendix – III

Statistical formula

A. Sample size:

To determine the sample size, this formula was used; $n = \frac{z^2 pq}{d^2}$

Where,

n = the desired sample size,

z = the standard normal deviate, usually set at 1.96 at 5% level,

which corresponds to 95% confidence level,

p = proportion of population, q

= 1- p

d = the degree of accuracy level considered as 5.0 %,

which assumes 0.05

If population size, N < 10,000 than the required sample size is very much smaller which was calculated by the following formula –

$$n_f = \frac{n}{1 + \frac{n}{N}}$$

Where,

n_f = the desired sample size, when population size, N < 10,000

n = the desired sample size, when population size, N > 10,000 N

= the roughly estimated population size.

B. Arrithmatic mean, $X = \frac{\sum fx}{N}$ (for grouped data)

C. Standard deviation , $SD = \sqrt{\frac{\sum (X - \bar{X})^2}{}}$

('O' indicates observed value and 'E' indicates expected value)

D. $$Z = \frac{P_1 - P_2}{\sqrt{\left[\frac{P_1 Q_1}{N_1} + \frac{P_2 Q_2}{N_2}\right]}}$$

P_1 indicates proportion in first group

P_2 indicates proportion in second group

$Q_1 = 100 - P_1$

$Q_2 = 100 - P_2$

N_1 indicates sample size of first group

N_2 indicates sample size of second group.

E. $$SD = \sqrt{\frac{\sum (X - \bar{X})}{(N-1)}}$$

Here, $\bar{X}$ indicates mean value
X indicates individual value
N indicates sample

APPENDIX IV - - PLAGIARISM

APPENDIX V — MASTER CHART

S.No	Name	Age	Sex	Ip. No.	Presenting Complaints	Co - Morbidity	Investigations								Diagnosis				Procedure Done	Lag Period	Duration of Surgery	Follow up		HPE Report
							Imaging	SBP	PR	GCS	Hb	TC	Urea	Na+	K+	Albumin		Inf	Tra	Malig	Misc				Morbidity	Mortality	
1	Kasthuri	70	F	100609	Abd pain ,Distension	DM	Dilated bowel loop,air underdiaphragm	90	128	15	10.6	6,800	7	145	4.7	3.4	Single Caecal Perforation	+	-	-	-	Primary closure with loop ileostomy	<24 hrs	1-2hrs	-	-	-
2	Vanitha	28	F	100112	Abd pain, distension	-	Dilated bowel loops, Multiple air fluid levels	110	132	15	11	13,800	8.3	139	4.3	5	Incisional hernia with Intestinal Obstruction	-	-	-	+	Rsection and anastomosis of ileum and Mesh Repair	<72 hrs	>2hrs	WI	-	-
3	Selvam	42	M	104364	Abd pain	HT,CAD	Dilated bowel loop/ CT-gangrenous small bowel	140	72	15	11	21,000	11	133	3.8	4	SMA Occlusion with Gangrenous bowel	-	-	-	+	Resection and anastomosis of ileum and transverse colon	>72hrs	>2hrs	At	MODS	-
4	Raman	37	M	107254	Abd pain diste	-	Dilated bowel loops, Multiple air fluid levels	90	124	13	13	9,700	12	129	4.4	4.2	Acute Intestinal Obstruction/ileal perforation	+	-	-	-	Limited resection and anastomosis of ileum	>72hrs	>2hrs	WD	-	-
5	Venkatesan	35	M	108358	Abd pain	-	Dilated bowel loops, Multiple air fluid levels	100	96	15	12	11,800	6	139	4.5	4.4	Ileal Perforation	+	-	-	-	Primary closure	<48hrs	1-2hrs	-	-	TYP
6	Perumal	60	M	108986	Abd pain, distension	DM, HT	Dilated bowel loops, Multiple air fluid levels	110	99	15	13.2	9,800	11.3	140	3.3	3.9	Intestinal Obstruction with caecal mass	-	-	+	-	Right Hemicolectomy with ileotransverse anastomoses	<24 hrs	1-2hrs	-	-	-
7	Anushya	18	F	114531	Abd pain,fever	TB	dilatedn bowel loops	110	106	15	9.2	9,000	8	135	4.1	5	Intestinal obstruction with Gangrenous ileum	-	-	-	+	Ileal Resection / Proximal Ileostomy with Distal closure of ileum	<24 hrs	1-2hrs	-	-	-
8	Komala	60	F	115655	Abd pain, distension	DM	Dilated bowel loops, Multiple air fluid levels	110	68	15	11.9	5,500	8	129	3.1	4.1	Intestinal Obstruction/ Ileal perforation	-	-	-	+	Laparotomy and loop ileostomy	<48hrs	1-2hrs	DVT	-	-
9	Rani	61	F	115461	Abd pain	-	Dilated bowel loops, Multiple air fluid levels, free fluid abd	90	96	15	8.8	10,800	7.8	141	3.3	4.2	Small intestinal Obstruction/ Ileal perforation	-	-	+	-	Resection and anastomoses of ileum	>72hrs	>2hrs	AL	-	-
10	Govindasamy	60	M	116497	Abd pain	DM, HT	Dilated bowel loops, Multiple air fluid levels	110	98	15	10.9	21,900	6	138	3.7	3.8	Intestinal Obstruction/ caecal mass	-	-	+	-	Right Hemicolectomy with ileotransverse anastomoses	<24 hrs	>2hrs	-	-	-
11	Elumalai	59	M	121112	Abd pain, distension	-	Dilated bowel loops, Multiple air fluid levels	94	102	15	11.2	5,300	12	125	2.8	4.1	Acute Intestinal Obstruction	-	-	-	+	Resection of gangrenous distal ileum and anastomoses	>72hrs	1-2hrs	AL	MODS	-
12	Rajamanickam	78	M	120900	Abd pain	HT, CAD	Dilated bowel loops, Multiple air fluid levels	110	86	15	10.8	22,400	6.5	138	4.2	3.9	Right Obstructed hernia/ ruptured colon perforation	-	-	-	+	Rt Hemicolectomy with ileotransverse anstomoses	<48hrs	1-2hrs	-	Sepsis	-
13	Rajesh	35	M	122125	Abd pain	-	freefluid abdomen	84	112	14	10.8	4,600	9	135	5.8	4.9	blunt Injury Abdomen/ terminal ileal perforation	-	+	-	-	Laparotomy/ Primary closure of ileal perforation	>72hrs	1-2hrs	PE	MODS	-
14	Ramadoss	60	M	107582	Abd pain, distension	HT	Dilated bowel loops, Multiple air fluid levels	124	87	15	10.8	8,700	6.5	143	4.4	4	Acute Intestinal Obstruction	-	-	+	-	Limited resection of ileum and end ileostomy	<48hrs	1-2hrs	-	-	-
15	Sivakumar	61	M	123554	Abd pain, distension	-	Dilated bowel loops, Multiple air fluid levels	96	122	15	11.4	5,700	5.5	144	4.2	4..2	Acute Intestinal Obstruction/multiple ileal Perforation	-	-	-	+	Resection and anastomosis of ileum	<24 hrs	1-2hrs	WI	-	-
16	Raja	24	M	126087	Abd pain	-	Dilated bowel loops, Multiple air fluid levels, free fluid abd	114	102	15	12.6	5,200	6.2	133	3.6	5.3	Acute Intestinal Obstruction/multiple ileal Perforation	+	-	-	-	Resection and anastomosis of ileum	<48hrs	1-2hrs	At	-	TYP
17	Habeeb	65	M	127651	Abd pain, distension	-	Dilated bowel loops, Multiple air fluid levels	102	106	15	10.6	27,800	10	140	5.6	4	Acute Intestinal Obstruction/multiple ileal Perforation	+	-	-	-	Resection of short segment of ileum with ileostomy with mucus fistula	<24 hrs	1-2hrs	WD	-	-
18	Chinnadurai	39	M	130026	Abd pain	-	freefluid abdomen	90	110	14	11.9	6,700	5.7	142	6	4.8	Ileal Perforation	+	-	-	-	Primary closure	>72hrs	>2hrs	WD	-	TYP
19	Krishnan	50	M	128666	Abd pain, distension	DM	Dilated bowel loops, Multiple air fluid levels	110	114	15	10.8	22,000	6.2	142	5.3	4.6	Adhesive Intestinal Obstruction	-	-	-	+	Adhesiolysis with resection of short segment of ileum and anastomoses.	<48hrs	1-2hrs	-	-	-
20	Pappathiyammal	67	F	132399	Abd pain ,irreducible swelling in laparotomy scar	DM,COPD	Dilated bowel loops, Multiple air fluid levels	104	122	15	11.8	8,000	7	136	3.8	3.9	Intestinal Obstruction / incisional Hernia	-	-	-	+	Resection and anastomoses of ileum and transverse colon with mesh repair	<72 hrs	1-2hrs	At	-	-
21	Ruckmani	62	F	130193	Abd pain ,irreducible swelling in Rt femoral region	-	Dilated bowel loops, Multiple air fluid levels	110	75	15	12	5,800	7.2	140	4.2	4	strangulated femoral hernia	-	-	-	+	Resection and anastomoses of gangrenous ileum and hernia repair	>72hrs	1-2hrs	-	-	-
22	Palaiyan	52	M	128312	Abd pain ,irreducible swelling in Rt inguinal region	COPD	Dilated bowel loops, Multiple air fluid levels	122	108	15	11.4	23,500	8	139	5.4	4.3	Obstructed Inguinal hernia	-	-	-	+	Resection and anastomoses of ileum with hemiorrhaphy	<24 hrs	1-2hrs	-	-	-

23	Subramani	45	M	3772	Abd pain	HT	Dilated bowel loops, Multiple air fluid levels	130	110	12	14	9000	10	138	3.9	4.9	Ileal perforation with addhesions	+	-	-	-	Resection and anastomoses of ileum/ Adhesiolysis	>72hrs	1-2hrs	WI	-	-
24	Parameswaran	56	M	4710	Abd pain	-	Air under diaphragm, free fluid abdomen	130	98	15	10	5,500	12	144	4.2	5	RTA with blunt Injury Abdomen	-	+	-	-	Limited resection and anastomoses of ileum and peritoneal lavage	<48hrs	1-2hrs	-	-	-
25	Chinnarassu	28	M	5127	Abd pain	TB	Air under diaphragm, free fluid abdomen	110	102	15	13	12,800	9	141	3.5	5.2	Ileal perforation	+	-	-	-	Primary closure of ileal perfortion	<72 hrs	>2hrs	–	-	TB
26	Ragavaiah	75	M	5158	Abd pain	HT, CAD	Dilated bowel loops, Multiple air fluid levels	120	80	15	10.2	9,800	7	140	3.9	4	Strangulated Internal Hernia/gangrene of ileum	-	-	-	+	Resection of gangrenous ileum and anastomoses of ileum	>72hrs	>2hrs	At	-	-
27	Vaidhegi	77	F	5573	Abd pain	TB	Dilated bowel loops, Multiple air fluid levels,free fluid abd	100	97	15	13	11,800	11	137	3.3	3.9	Multiple ileal perforation	+	-	-	-	Ileal Resection with end Ileostomy and mucus fistula	<72 hrs	1-2hrs	DE	ARDS	-
28	Muthamilselvi	24	F	8694	Abd pain ,fever	TB	Dilated bowel loops,free fluid abdomen	90	104	12	10.2	13,300	10	133	3.5	4.9	Ileal perforation	-	-	-	+	Resection of perforated segment with end ileostomy	>72hrs	>2hrs	WD	-	-
29	Dhanancheyan	45	M	9464	Abd pain	-	Dilated bowel loops, Multiple air fluid levels	90	110	14	12	5,800	6	135	3.9	4.6	Obstructed Inguinal hernia	-	-	-	+	Resection of gangrenous caecum with diversion loop ileostomy	<24 hrs	>2hrs	-	-	-
30	Rajkumar	43	M	15999	Abd pain	-	Dilated bowel loops, Multiple air fluid levels	110	104	15	14	5,600	10	139	4.4	4.3	Ileal perforation	+	-	-	-	Resection and Anastomoses of distal ileum	>72hrs	>2hrs	AL	-	-
31	Vishal	20	M	15988	Abd pain ,	-		90	112	15	13	12,500	9	133	5.2	4.7	Ileal perforation	+	-	-	-	Primary closure	<24 hrs	>2hrs	_	-	TYP
32	Gopi	21	M	16501	Abd pain, distension	-	Dilated bowel loops, Multiple air fluid levels,free fluid abd,inflammed appendix	94	104	15	11	8,700	12	140	5.1	5	Intestinal Obstruction/ gangrenous ileum	-	-	+	-	Resection of ileal segment/ Appendicectomy/ End ileostomy/ Mesentric node biopsy	<24 hrs	1-2hrs	-	-	-
33	rajasekar	26	M	17710	Abd pain	-	Dilated bowel loops, Multiple air fluid levels	110	95	15	14	6,900	9	138	3.9	4.3	Intestinal Obstruction/ ileal perforation	-	-	+	-	resection of ileum and ileo ascending colon anastomoses	<48hrs	1-2hrs	-	-	TYP
34	Chandraveni	34	F	19266	Abd pain , distension	-	Dilated bowel loops, Multiple air fluid levels,free fluid abd	130	87	15	14	7,800	15	133	3.4	4.3	Hollow viscus perforation	-	-	-	+	resection and anastomoses of gangrenous ileal loop and proximal covering loop ileostomy	>72hrs	>2hrs	DE	MODS	-
35	Rajamani	58	M	19940	Abd pain	DM	Dilated bowel loops, Multiple air fluid levels,free fluid abd	90	106	15	11	13,600	11	139	4.4	3.9	blunt Injury Abdomen	-	+	-	-	Laparotomy/ Primary closure of ileal perforation	<72 hrs	1-2hrs	WD	-	-
36	Meena	43	F	20931	Abd pain, distension	-	Dilated bowel loops, Multiple air fluid levels	160	104	14	9.8	7,800	15	134	3.2	2.7	Obstructed incisional hernia	-	-	-	+	Resection of gangrenous ileum and end to end Anastomoses of ileum with anatomical repair	<48hrs	1-2hrs	-	ARDS	-
37	Mathiazhagan	45	M	19413	Abd pain	DM ,HT	Air under diaphragm, free fluid abdomen	90	98	15	10	6,600	11	138	3.8	4	Distal Ileal perforation	+	-	-	-	Rt Hemicolectomy with ileotransverse anstomoses	>72hrs	1-2hrs	-	-	-
38	Kanthan	37	M	14657	Abd pain	-	freefluid abdomen	96	110	15	12	5,400	8	135	4.3	4.4	RTA/Ileal perfoartion	-	+	-	-	Primary closure	<72 hrs	1-2hrs	WI	-	-
39	Babu	40	M	27283	Abd pain , distension	-	dilated bowel loops	110	98	15	13	10,200	9	134	3.9	4.2	Intestinal Obstruction/ gangrenous jejunum/ ileum	-	-	-	+	Resection of small bowel/duodenal fistula/ascending colon mucous fistula	<24 hrs	>2hrs	DE	-	-
40	Selvaraj	23	M	28243	Abd pain	-	Dilated bowel loops, Multiple air fluid levels	160	72	15	13	9,800	11	138	3.9	3.8	Distal Ileal perforation	+	-	-	-	Limited resection and ileoascending colon anastomoses	<48hrs	>2hrs	DVT	-	-
41	Elumalai	62	M	22774	Abd pain ,irreducible swelling in Rt inguinal region	-	Dilated bowel loops, Multiple air fluid levels	150	88	15	11	13,700	12	140	4.6	4	Right Obstruted inguinal hernia	-	-	-	+	Resection and end to end anastomoses of ileum and rightorchidectomy	<48hrs	1-2hrs	AL	-	-
42	Selvaraj	23	M	28437	Abd pain	-	Dilated bowel loops, Multiple air fluid levels	130	94	15	13	12,800	9	139	3.3	4.1	Distal Ileal perforation	+	-	-	-	Limited resection and ileoascending colon anastomoses	>72hrs	>2hrs	-	-	-
43	Kalaimma	61	F	32506	Abd pain	-	Dilated bowel loops, Multiple air fluid levels	130	90	15	13	12,800	10	138	3.9	4	Intestinal Obstruction/ Ileal knotting with band	-	-	+	-	Resection and anastomoses of ileum	<72 hrs	1-2hrs	-	-	-
44	Harish	18	M	33379	Abd pain , distension	-	Air under diaphragm, free fluid abdomen	130	93	15	15	6,600	10	138	4.2	4.5	Ileal Perforation	+	-	-	-	Primary closure of ileal perfortion	<72 hrs	1-2hrs	-	-	TYP
45	Rathinam	40	M	25639	Abd pain	HT	freefluid abdomen	88	98	15	11	4,600	11	135	4.2	4	Distal Ileal perforation	+	-	-	-	Limited resection and ileoascending colon anastomoses	<48hrs	1-2hrs	-	MODS	-
46	Najima Begam	41	F	43371	Abd pain , distension	-	Air under diaphragm, free fluid abdomen, dilated bowel loop	120	72	15	13	8,600	6	139	3.9	4.2	Multiple ileal perforation	-	-	-	+	Resection and end ileostomy	<48hrs	1-2hrs	-	-	-
47	Yuvarani	18	F	45893	Abd pain , distension	-	Air under diaphragm, free fluid abdomen, dilated bowel loop	110	92	15	13.6	8,700	5	142	3.6	3.8	Multiple ileal perforation	+	-	-	-	Resection and end ileostomy	<24 hrs	1-2hrs	-	-	TYP
48	Jayamary	52	F	52637	Abd pain	-	Dilated bowel loops, Multiple air fluid levels	130	72	15	12	11,200	6	138	4.2	3	Distal Ileal perforation	-	+	-	-	Limited resection and end ileostomy	>72hrs	>2hrs	WD	-	-
49	Loganathan	40	M	52520	Abd pain , distension	-	Dilated bowel loops, Multiple air fluid levels	110	72	15	10.9	6,600	10	133	3.4	4.9	Intestinal obstruction/ Ileal perforation	-	-	+	-	Limited resection and anastomoses	<24 hrs	1-2hrs	-	-	-
50	Devaki	40	F	57267	Abd pain , distension	-	Dilated bowel loops, Multiple air fluid levels	110	84	15	11.6	6,200	7	141	4.2	3.9	Intestinal Obstruction/ Ileal gangrene	-	-	-	+	Limited resection and anastomoses	<24 hrs	1-2hrs	-	-	-

KEY :

BA - - Bronchial Asthma
DM - - Diabetes Mellitus
SHT / HTN - - Systemic Hypertension
CAD - - Coronary Artery Disease
TB - - Tuberculosis
SBP - - Systolic Blood Pressure
PR - - Pulse Rate
GCS - - Glasgow Coma Scale
Hb - - Hemoglobin
TC - - Total Count
Obst - - Obstruction
Perf - - Perforation
Inf - - Infection
Tra - - Trauma
Malig - - Malignancy
Misc - - Miscellaneous
WI - - Wound Infection
WD - - Wound Dehiscence
At - - Basal Atelectasis
AL - - Anastomotic Leak
DE - - Dyselectrolytemia
DVT - - Deep Vein Thrombosis
MODS - - Multi Organ Dysfunction Syndrome
ARDS - - Acute Respiratory Distress Syndrome